U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE UNIVERSITY OF IDAHO AGRICULTURAL EXPERIMENT STATION, E. J. IDDINGS, DIRECTOR; P. P. PETERSON, IN CHARGE SOIL SURVEY.

SOIL SURVEY OF KOOTENAI COUNTY, IDAHO.

BY

H. G. LEWIS, OF THE U. S. DEPARTMENT OF AGRICULTURE, IN CHARGE, AND W. A. DENECKE, JR., OF THE UNIVERSITY OF IDAHO.

MACY H. LAPHAM, INSPECTOR, WESTERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1919.]

WASHINGTON:
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1923.

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LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Soils,
Washington, D. C., April 17, 1922.

Sir: I have the honor to transmit herewith the manuscript report and map covering the survey of Kootenai County, Idaho, and to recommend that they be published as advance sheets of Field Operations of the Bureau of Soils, 1919, as authorized by law.

This work was carried on in cooperation with the University of Idaho Agricultural Experiment Station, E. J. Iddings, Director; P. P. Peterson, In Charge Soil Survey.

Respectfully,

Milton Whitney,
Chief of Bureau.

Hon. H. C. Wallace,
Secretary of Agriculture.

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SOIL SURVEY OF KOOTENAI COUNTY, IDAHO.

By H. G. LEWIS, of the U. S. Department of Agriculture, In Charge, and W. A. DENECKE, Jr., of the University of Idaho Agricultural Experiment Station.—Area Inspected by MACY H. LAPHAM.

DESCRIPTION OF THE AREA.

Kootenai County, Idaho, lies in the northern part of the State, commonly known as the "Panhandle," and adjoins the State of Washington on the west.

The county contains 1,302 square miles. Of this 62 square miles is water surface. Approximately 414 square miles, lying within the Coeur d'Alene and Pend Oreille National Forests, is not covered in this survey. The land area surveyed amounts to 806 square miles, or 515,840 acres.

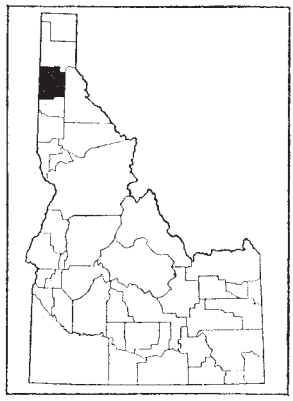


FIG. 1.—Sketch map showing location of the Kootenai County area, Idaho.

Kootenai County, as originally laid out in 1864, comprised all of Idaho north of the forty-eighth parallel. It was not until about 1867, however, that the county was organized. It then included all of the Panhandle north of the present Latah County and west of Shoshone County. Bonner County was formed from Kootenai County in 1907, and Benewah County in 1915.

The soil map accompanying this report is based in part upon topographic maps published by the Geological Survey and in part upon a plane-table traverse. Topographic sheets were available for the northern three-fourths of the county. These were enlarged to the scale of 1 inch to 1 mile and corrected to some extent to show changes in culture. The traverse base was made by the soil-survey party.

The topography of the area is quite varied, ranging from flat alluvial valleys, smooth, nearly level bench lands, and gently rolling uplands to steep and rugged mountainous areas. (See Pls. I and II.) Present salient topographic features of the region have to a great extent been determined by relatively recent geologic events, chief of which are the extrusion of the Columbia River lava flow and the invasion of the region by glacial ice. That the Columbia River

lava flow originally formed the surface over much of this area, particularly in its south-central and southwestern parts, is shown by numerous outcrops of the basaltic rocks of which it is composed. It occurs in isolated spots in the Rathdrum Prairie region and forms a prominent bench of rim rock along the eastern edge of this prairie in the vicinity of Hayden Lake and north to Chilco. The lava rock also forms conspicuous elevations, escarpments, and bench lands in the vicinity of Coeur d'Alene and in many places along each side of Coeur d'Alene Lake, and south to the county line. Remnants of similar basaltic plateau areas also extend along the Coeur d'Alene River to a point about 4 miles above Medimont. Basalt lies underneath the soil material on the Harrison Flats and in the region around Worley, or the Palouse Country, where it outcrops occasionally. In this latter region, however, the rock has been covered by a mantle of wind-laid soils that have a rolling to hilly topography.

Subsequently to the lava extrusion the glacial ice moved down the valley to the north of Coeur d'Alene and deposited drift materials over the lower lying areas. The result of glaciation is plainly visible in the deposits of bowlders, gravel, and sand of the glacial-outwash plains in the northern part of the county. The effects of glaciation, though not so marked as in the valley in the northern part of the county, are also to be seen on the Mica Flats, and the lower slopes bordering the Coeur d'Alene River valley. Unassorted glacial material is present on many of the higher ridges, and the rounded ridges and higher mountain peaks show the effects of the grinding or plowing action of the ice.

Physiographically the area may be divided into the following five physiographic divisions: (1) The Rathdrum Prairie, or glacial-outwash plain; (2) the rolling to hilly or foothill areas; (3) the elevated hilly or rough mountainous areas; (4) the rolling prairie or basaltic plateau of the southern part of the county; (5) the glacial-lake and recent-alluvial bottom lands.

The Rathdrum Prairie lies in the northern part of the county, where it covers an extensive area. It is mainly a plain built up of materials laid down by the waters released from the melting ice, but includes some areas of apparently ice-laid materials. This prairie varies in topography from smooth and nearly level to gently rolling, but gives way on each side to steep and rough mountainous slopes. It ranges in width from about 18 miles along the northern county boundary to about 6 miles along the Washington State line, and is bounded on the south by Coeur d'Alene Lake. The general elevation of this prairie ranges from 2,125 feet near its southern end to 2,400 feet along the northern county line. There are within it a few isolated hills or knolls that are not covered by the glacial

outwash material. Of these Lone Mountain, north of Ramsey, is the best example.

The rolling to hilly or foothill areas lie above the outwash plain in the northern part of the county and extend on both sides of Coeur d'Alene Lake as far south as Lake Creek on the west and the Carlin Bay region on the east. They also occupy the lower upland slopes along the Coeur d'Alene River valley.

The topography of these areas ranges from gently rolling to mountainous. On the lower slopes the topography in most places is favorable for farming. The elevation ranges from 2,200 to 2,500 feet above sea level.

The elevated hilly to rough mountainous areas comprise a large part of the county. The extreme northwestern part of the county is typical rough mountainous land, consisting of steep slopes with V-shaped drainage courses. The region south of the Spokane River, west of Mica Flats and north of Lake Creek, has a similar topography. The region on the east side of the Rathdrum Prairie is also rough mountainous land, with lower slopes of hilly areas or foothills. The valley of the Coeur d'Alene River gives way on each side to typical rough mountainous land, except for some of the lower and less rugged foothills. The elevation of this physiographic belt ranges from 2,400 feet above sea level to more than 5,000 feet on the higher peaks, such as Chilco, Mica, and Latour Peaks.

The rolling prairie or basaltic plateau region lies in the southern part of the county almost exclusively, being found both east and west of Coeur d'Alene Lake. The elevation of Harrison Flats and the typical Palouse Country in the southwest corner of the county ranges from 2,500 to 2,600 feet above sea level. Coeur d'Alene Lake is 2,124 feet above sea level, and there is an abrupt descent from the rolling prairie country to the lake of 400 to 500 feet in a distance of 1 to 1½ miles. Indian and Worley Mountains rise from 200 to 450 feet above the level of the surrounding country.

The glacial-lake and recent-alluvial bottom lands occupy the small stream bottoms, low-lying stream deltas, or other lowlands about the arms of Lake Coeur d'Alene and exposed glacial-lake beds. The topography is smooth and gently sloping to flat and poorly drained. The largest area of recent-alluvial material is found along the Coeur d'Alene River. The valley of this stream is from three-fourths to 2½ miles wide. The elevation ranges from 2,124 to 2,200 feet above sea level.

The elevation of the county ranges from 2,124 feet above sea level at Coeur d'Alene Lake to more than 5,000 feet on the higher peaks. A large part of the county is rough and mountainous. The western and northwestern parts of the county are occupied by an extension of the Selkirk Range. The eastern side of the Rathdrum Prairie

Valley is bounded by the Chilco Mountains and by ridges associated with the Coeur d'Alene Mountains, the latter occupying most of the eastern part of the county.

Coeur d'Alene Lake receives the greater part of the drainage waters of the county. Its outlet is the Spokane River, which flows in a westerly direction along the southern edge of Rathdrum Prairie into Washington, and later joins the Columbia River. This lake lies in the central-southern part of the county, extending from Coeur d'Alene to the southern county line, a distance of about 25 miles. It varies in width from 1 to 2½ miles, and has numerous arms and bays. The principal streams entering from the west side are Cougar, Mica, Rockford, and Lake Creeks. The main stream entering on the east side is the Coeur d'Alene River, which drains the larger part of the southeastern and south-central parts of the county. Other creeks entering the lake from the east side are Carlin, Wolf Lodge, and Blue Creeks. The St. Joe River enters Coeur d'Alene Lake just outside the southern boundary of the county. The Spokane River and Coeur d'Alene Lake with its tributaries drain the larger part of the county.

The extreme southwestern part of the county, or the Palouse Country, drains to the west through Rock Creek and its tributaries. The Rathdrum Prairie region is not cut up by drainage courses, as the drainage is effected by subterranean drainage through the porous gravels and sands of the glacial outwash material. The extreme northeastern part of the county is drained into Pend Oreille Lake, which has an outlet into Clarks Fork of the Columbia River. A few square miles in the northwestern corner of the county drain into Spirit Lake, which has an outlet through Spirit Lake Creek to the north into Clarks Fork of the Columbia River.

Many lakes are found on each side of the Rathdrum Prairie and along the Coeur d'Alene Valley. These occupy mountain valleys that have been dammed by outwash material or other glacial deposits. Much of the drainage of the uplands enters these lakes, which have no surface outlets but have a subterranean drainage through the stone and gravel substratum of the prairie region.

The soils of the larger part of the county are well drained, owing to the loose and porous nature of the substratum. The Coeur d'Alene River valley and a few small areas at the confluence of the small streams with Coeur d'Alene Lake are in general poorly drained, and are subject to overflow during the spring months. The floor of the Coeur d'Alene River valley lies only a few feet above the level of Coeur d'Alene Lake.

While Catholic missionaries began their work with the Indians along the Coeur d'Alene River in 1850, and trappers for the Hudson Bay Co. had visited the country before that year, it was not until about 1878, when Fort Sherman was established on the site of Coeur

d'Alene, that permanent settlement began. In the early eighties, with the completion of the Northern Pacific Railway and the development of the Coeur d'Alene mines at Wallace, the city of Coeur d'Alene was founded. Following this settlement of the prairie region became very active, and within the next few years the most desirable land was taken up. According to the 1920 census the population of the county is 17,878, of which 63.8 per cent is classed as rural. At the present time practically all areas of farming land are settled. The rough mountainous areas are sparsely settled. The Rathdrum Prairie section is thickly settled for the most part, especially on the more desirable soil types. The Palouse Country, in the southwestern part of the county, is thickly settled, and the forested areas of Helmer soils in the southern part of the county are fast being cleared and farmed. The greater part of the population is native born, coming from the Middle Western States. The foreign-born population consists mainly of Scandinavians, Germans, and Canadians.

The principal towns of the county are Coeur d'Alene, Harrison, Spirit Lake, Rathdrum, Post Falls, Worley, Rose Lake, Athol, and Bayview. Besides these principal towns there are many smaller towns and post offices.

Coeur d'Alene is the county seat. It is the largest city in the county, having a population of 6,447. It is situated on a gently sloping bench at the northern end of Coeur d'Alene Lake and at the source of the Spokane River. The city has modern improvements and good schools. The principal industrial plants include three large lumber mills, a plant producing cross ties, and a modern factory for canning fruits and vegetables.

Harrison, with a population of 674, is situated where the Coeur d'Alene River enters Coeur d'Alene Lake, about 20 miles south of Coeur d'Alene. It has a sawmill and is a distributing point for the Harrison Flats farming section. The village of Spirit Lake, on Spirit Lake, in the northern part of the county, has a population of 940. It has a large sawmill and is a distributing point for the northern part of the county. Rathdrum is located about 15 miles northwest of Coeur d'Alene, on the Rathdrum Prairie. It is the center of a well-developed farming section, and has a population of 509. Post Falls, with a population of 576, is located about 9 miles west of Coeur d'Alene, on the Spokane River. It has a large sawmill and power plant and is a supply point for a good farming section. Rose Lake, along the Coeur d'Alene River, in the southeastern part of the county, is also the location of a large sawmill. Worley is located in the Palouse Country in the southwestern corner of the county. It is a supply point for a good farming section. Athol and Bayview are small towns in the northern part of the county.

The agricultural sections of the county are well supplied with transportation facilities. The outwash plain or prairie region in the northern part of the county is traversed by the main line of the Northern Pacific Railway, by the Chicago, Milwaukee & St. Paul Railway and by the Spokane International Railway from Spokane to Sand Point, Idaho, into Canada. A branch runs from Corbin Junction to Bayview on Lake Pend Oreille. Coeur d'Alene is served by branch lines of all these railroads, and also by the Inland Empire (Spokane and Eastern (electric)). The Coeur d'Alene River Valley is served by the line of the Oregon-Washington Railroad & Navigation Co., extending from Tekoa, Wash., to Wallace, Idaho. The southwestern part of the county is served by the main line of the Chicago, Milwaukee & St. Paul Railway and a branch of the Oregon-Washington Railroad & Navigation Co. from Spokane, Wash., to Amwaco on Coeur d'Alene Lake.

Points on Coeur d'Alene Lake are served by boats plying between Coeur d'Alene and Harrison and St. Maries, in Benewah County. This service is important to the southern part of the county.

As a whole, the roads of Kootenai County are good. The roads in the Rathdrum Prairie region are good throughout most of the year. The roads in the southern part of the county on the Palouse and Helmer soil types are good during the summer months, but are slippery and muddy during the rainy season. The roads in the rougher or more mountainous areas are steep and rather rocky in most places. The Yellowstone Trail, running through the county from Cataldo to Coeur d'Alene and thence to Spokane, is being converted into a fine automobile road. At the present time (1919) much new work is being done on the roads, and within the next few years the roads of Kootenai County will show much improvement.

Kootenai County has been a lumbering country from the first, and only within the last few years has farming become an active industry. All of the foothills and rough mountain lands, and parts of the rolling plateau, supported a heavy growth of yellow pine, fir, tamarack, and some white pine. As the timber has been cut, the lands have been cleared and placed under cultivation, resulting in a gradual yet steady increase in farming in the last few years.

Formerly the surplus of farm products were sold locally; but as the production increased, outside markets have been found in Wallace, the Coeur d'Alene mining district, and in Spokane, Wash., which is only 35 miles west of Coeur d'Alene. Grains are now being shipped to Portland, Oreg., and other coast points.

Rural free delivery of mail extends to all the more thickly populated parts of the county. The rural districts are well supplied with good school buildings. The county has good telephone service, even in the sparsely settled sections.

CLIMATE.

The Coeur d'Alene Mountains, which border Kootenai County and the surrounding region on the east, protect the region from the cold easterly winds. The region, however, is subject to quite varied temperature. The summer months as a rule are dry. The temperature is not oppressive during the day, and the nights are characteristically cool. The mean annual temperature, according to records of the United States Weather Bureau at Coeur d'Alene, is 41.1° F. The mean temperature for January, the coldest month, is 26.3° F., and for July, the warmest month, 67.3° F. The records show an absolute annual range of 118°, or from 102° F., in July as a maximum, to —16° F. in January, as a minimum. The cold spells of the winter months are usually of short duration, and are quite commonly followed by warm dry winds, known as "chinooks," which break up the cold weather and melt the snow quickly. The fall months are characterized by a rainy period lasting for two weeks or more, followed by cool to cold weather. Snow lies on the ground for two to six weeks during midwinter. The spring months are usually rainy.

The average annual precipitation at Coeur d'Alene is 24.90 inches. There is a gradual increase in the precipitation from the west county line to the east, the amount ranging from 20 inches along the west border to more than 24 inches in the more mountainous sections of the eastern part of the county. Most of the precipitation comes during the winter months, the mean precipitation for December, January, and February being 9.51 inches. The summer months are quite dry, the mean precipitation for June, July, and August being 2.74 inches. The distribution of precipitation is favorable for grain and hay harvesting. Although the rainfall during the summer months often is not sufficient for good crop yields, complete crop failures from drought are unknown.

The average date of the last killing frost in the spring is May 5, and that of the first in the fall October 1. This gives an average growing season of 149 days, which is ample for the maturing of the general farm crops grown in this region. Frosts often occur on some of the valley floors earlier than on the adjacent upland slopes. Winter wheat is seeded from about August 15 to October 1, depending upon the moisture conditions. Wheat is usually harvested the latter part of July or early in August.

During the summer the prevailing winds are from the southwest and during the winter from the south. Cold winds from the north and east occur during periods of very cold winter weather. Very few windstorms occur, but there are occasional dust storms from

the southwest. These transport and deposit relatively large quantities of silty material. In the southern part of the county much of the soil material is of wind-laid origin.

The statistics given in the following table, compiled from the records of the Weather Bureau station at Coeur d'Alene, are representative of conditions in the western part of the county.

Normal monthly, seasonal, and annual temperature and precipitation at Coeur d'Alene.

(Elevation, 2,157 feet.)

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1882).	Total amount for the wettest year (1893).
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
December	31.5	60	−10	3.56	1.57	4.50
January	26.3	60	−16	3.59	4.10	.85
February	29.8	54	−15	2.36	3.27	4.25
Winter	29.2	60	−16	9.51	8.94	9.60
March	38.4	70	0	2.35	.14	3.35
April	47.1	82	10	1.82	2.10	4.75
May	55.0	91	27	1.92	1.69	3.75
Spring	46.8	91	0	6.09	3.93	11.85
June	60.8	96	33	1.50	.16	.75
July	67.3	102	38	.75	.00	.75
August	67.2	100	32	.49	.00	.00
Summer	65.1	102	32	2.74	.16	1.50
September	57.4	94	27	1.37	.08	2.50
October	47.6	79	17	1.70	.59	5.50
November	36.8	66	−13	3.49	.29	7.00
Fall	47.2	94	−13	6.56	.96	15.00
Year	47.1	102	−16	24.90	13.99	37.95

AGRICULTURE.

The agricultural development of Kootenai County began about the time of the building of the Northern Pacific Railway and the opening of the Coeur d'Alene mines near Wallace, Idaho, in the early eighties. There were in the Coeur d'Alene River valley prior to this time a few settlers who raised grain, hay, vegetables, and some live stock. After the building of the railroad through Rathdrum Prairie, new settlers took up the most desirable prairie soils, which supported

only a growth of grasses and required but little work to put them under cultivation. The lands most favorable to farming with respect to topography, native vegetation, water, and productiveness are found along the Coeur d'Alene River valley and in the prairie region in the northern part of the county. In a very short time these prairie lands were all occupied. Outside of this prairie region it is necessary to clear the land of forest before it can be cultivated, and this in most cases is expensive, the cost ranging from $25 to $100 an acre.

The larger part of the southern half of the county was originally included within the Coeur d'Alene Indian Reservation, and the last of these lands were not thrown open to settlement until 1910; consequently this part of the county has been developed only within the last few years. At the present time (1919) the Harrison Flats, southeast of the town of Harrison, and the Worley section, or Palouse Country, in the southwest corner of the county, are the foremost agricultural sections. This part of the county, except for a few square miles in the extreme southwest corner, supported a heavy forest, but the larger part of it has been logged off and is rapidly being prepared for agriculture.

According to the 1920 census, the average size of the farms is 158.4 acres, of which 56.6 acres is improved land. The total number of farms increased from 20 in 1880 to 1,396 in 1920. In 1920, 84.6 per cent of the farms were operated by owners, 13.8 per cent by tenants, and 1.6 per cent by managers.

The present agriculture of the county consists mainly of the growing of grains and hay, the raising of live stock, dairying, fruit growing, and gardening.

The 1920 census reports 9,260 acres in all tame or cultivated grasses, yielding 8,253 tons; 4,596 acres in timothy alone, with a yield of 3,152 tons; and 2,925 acres in timothy and clover mixed, with a yield of 3,025 tons. There were 12,334 acres in small grains cut for hay, producing 9,155 tons, 2,000 acres of wild grasses cut for hay, with a production of 1,378 tons. According to the census the acreage devoted to the production of hay and forage crops exceeds that of the other main crops. The forage is fed to live stock, little or none of it being shipped out of the county. The grain crops are grown as cash crops. Of the hay crops, wild grasses and timothy, are grown principally in the valley of Coeur d'Alene River, while timothy and mixed clover and timothy are grown in other sections. A small quantity of alfalfa is also grown. The 1920 census reported 581 acres in this crop with a production of 801 tons. Under ordinary conditions alfalfa has not proved as successful as other hay crops.

The cereal crops grown, in the order of their importance, are wheat, oats, rye, corn, and barley. The wheat acreage in 1919 was 17,951, with a production of 228,598 bushels. Wheat has been the principal cereal crop in recent years, and is grown on nearly every farm in the county. About 75 per cent of the wheat grown is winter wheat. The principal varieties are Turkey, Red Russian, Martin (Martin's Amber), Jones Fife, and Goldcoin (Fortyfold). The average yield is 15 to 18 bushels per acre. The principal spring wheats are Baart (Early Baart), Pacific Bluestem (Bluestem), and Marquis. The average yield of spring wheat is about 10 to 12 bushels. The lower yield of spring wheat is one cause of its relatively small acreage. Winter wheat is sowed from the latter part of August to the first of October, depending upon the moisture conditions. Practically all the wheat is sowed with a drill.

The acreage devoted to oats has decreased in the last few years, owing to the high prices obtained for wheat. In 1919 the acreage was 5,541, and the production 85,513 bushels. Oats are grown both as a hay crop and for grain. In some sections they are grown with field peas in the place of summer fallow and cut for hay. The average yield ranges from 25 to 30 bushels per acre. The principal varieties grown are Silvermine, Big Four, Swedish Select, White Russian, and Senator. When intended for forage, the crop is cut when the grain is in the dough stage. It is cut with a mower, like ordinary hay, or with a binder and handled in bundles.

Some winter rye is grown for the grain and some for forage. The grain yields range from 20 to 25 bushels per acre.

The larger part of the corn grown is cut for silage and used for feeding dairy cattle and other live stock. The yield of silage corn ranges from 5 to 10 tons per acre, and of grain from 20 to 60 bushels. The 1920 census reports 292 acres in corn for grain, with a production of 6,664 bushels. The principal varieties grown are Rustler, White Dent, Minnesota King, and Minnesota 13. Both yellow and white dent and yellow and white flint varieties succeed.

Only a few acres are devoted to barley, which seems to do well on some of the soil types.

Field peas have been grown more extensively in recent years than formerly, especially on the Helmer and Palouse soils, where they are sowed with oats as a forage crop. This plan is considered better than that of summer fallowing practiced heretofore. When grown alone for seed they produce from 10 to 18 bushels per acre, and when cut for hay they yield from 2 to 5 tons.

Irish potatoes are grown to some extent throughout the county. According to the 1920 census there were 1,420 acres in this crop in 1919, producing 97,504 bushels. The potatoes are usually of good

quality and free from scab. Yields of 100 sacks per acre are not uncommon in an average season. Within the last few years the commercial production of seed potatoes has become important. It seems that there are excellent opportunities for the extension of the seed-potato industry in this county. Among the principal varieties grown are the Idaho Rural, Netted Gem, and Early Ohio.

Hardy tree fruits, berries, and vegetables are grown by nearly every farmer for home consumption. The smaller fruits and berries, such as strawberries and gooseberries, do exceptionally well. Within the last few years fruit growing on a commercial scale has become highly developed. It is a specialized industry on the Garrison and Springdale soils in the following irrigated tracts: Hayden Lake tract, lying west of Hayden Lake; Dalton Gardens, lying about 4 miles north of Coeur d'Alene; Post Falls tract, in the vicinity of Post Falls and McGuires; and the Greenacres tract near the Idaho-Washington State line in the valley region. These tracts are irrigated by means of small privately owned plants, or are supplied with water through an association of water users or larger commercial organizations. Each of these tracts contain a few square miles. Here fruit growing and vegetable gardening are highly developed.

Specialized fruit growing, with some general farming, is also practiced on unirrigated upland tracts located in the Stanley Hill section east of Coeur d'Alene; in the Sunnyside district southeast of Coeur d'Alene; Pleasant View section, south of Post Falls; and the Black Rock section, lying on the west side of Coeur d'Alene Lake, between Mica and Rockford Bays. Fruits are also grown in other localities and on most of the soil types.

The principal fruits are apples, cherries, pears, plums, and peaches. Apples are the leading fruit crop. The chief varieties are the Jonathan, Wagener, Delicious, Rome Beauty, Banana, Wealthy, Esopus (Esopus Spitzenberg), Ben Davis, and Grimes. The principal varieties of cherries are the Napoleon (Royal Ann), Bing, and Republican (Black Republican); of peaches, the Columbia and Elberta; and of pears, the Bartlett.

In recent years truck farming has become quite important. Cabbage, cauliflower, celery, lettuce, eggplant, cucumbers, potatoes, tomatoes, peas, beans, and other vegetables are grown extensively in the vicinity of Coeur d'Alene. This city maintains a market where the producer sells his products direct to the consumer. The soils in this immediate region are well adapted to truck farming. Vegetables are also interplanted in the irrigated orchards.

Stock raising is rather important in Kootenai County. Nearly every farmer has a few head of cattle, horses, or hogs. The principal live-stock industry is cattle raising. There are a few pure-bred

herds in the county, but most of the cattle are of mixed breeding with Shorthorn blood predominating. The 1920 census reports 1,875 beef cattle, 6,000 dairy cattle, 9,365 hogs, and 1,141 sheep in the county.

The principal dairy herds are Holstein, Guernsey, and Jersey. Many farmers with small herds make butter at home, or ship the cream to the creamery at Coeur d'Alene, or to Spokane, Wash. The Coeur d'Alene River valley is an important dairy section, and much cream is shipped from the small settlements along the valley. At present (1919) there are only a few silos in the county. Corn constitutes a good silage crop, as does also a mixed crop of field peas and oats. The dairy industry is growing and will in all probability become one of the main sources of farm income in the county.

No definite system of crop rotation is practiced in the county. In the Palouse Country, in the southwestern part of the county, summer fallowing is practiced for the maintenance of soil moisture. This section is exclusively a wheat-farming belt, and a rotation consisting of wheat one year, followed by summer fallow, and then back to wheat, has been in common use. During the last few years a crop of field peas and oats has been substituted for the bare summer fallow. This plan proves more profitable, as the mixed crop produces from 2 to 5 tons of forage and builds up the soil by adding organic matter in the form of stubble, and the results indicate that moisture conditions for the following wheat crop are as favorable. The summer fallow method has been used on the prairie soils in the northern part of the county, as has also a rotation consisting of wheat, oats, timothy hay for two years, and back to wheat.

Very little attention has been given to the use of manures, commercial fertilizers, or green-manure crops. The soils as a whole are deficient in humus and could be made more productive by the application of organic manures.

According to the census only $1,374 was spent for fertilizers in 1919. This was probably used on special crops, such as vegetables or fruit.

Practically all the farm labor is done by the farmers and their families, except during the harvest season. The 1920 census reports an expenditure of $310,488 for farm labor.

Land values in Kootenai County are quite variable, depending upon the location and improvements. Farms in remote, partly developed sections range in price from $10 to $30 an acre. Recently cut over lands sell for $8 to $25 an acre. The better improved general farming land sells for $50 to $100 an acre, the price varying with improvements and nearness to markets. Orchard land, according to the stage of development and age of trees, sells for $100 to $400 or more an acre. Farming land in this county is in good demand.

SOILS.[1]

Kootenai County lies mainly in the Rocky Mountain soil region, but includes some areas of the Columbia River lava flow and of the loessial soils of the Northwestern Intermountain soil region.

The kinds of rocks and the geological formations are varied. The eastern part of the county is underlain mainly by sedimentary and metamorphosed sedimentary rocks of the Belt series, which includes large proportions of quartzite, shale, and slatelike rocks. Near Pend Oreille Lake, in the northeastern part of the county, some areas of granite and limestone occur in the foothills. The northwestern and western parts of the county are underlain by granite, gneiss, and mica-schist. Rocks underlying the Northwestern Intermountain region consist of the Yakima or Columbia River basalt. This formation outcrops as a rim rock along the eastern edge of the Rathdrum Prairie from Chilco south along Hayden Lake and on both sides of Coeur d'Alene Lake to the southern county boundary. It extends up the Coeur d'Alene River Valley about 4 miles above Medimont, and is exposed around nearly all the arms and bays on the western side of the lake. This basalt also underlies all of the Harrison Flats and the Worley section in the southern part of the county, but there does not contribute to the soil materials of the county.

Subsequently to the lava flow, which covered much of the southern part of the county, this region was glaciated. The ice covered the county, with the possible exception of some of the higher peaks. Moving down the Purcell Trench from the north, it carved out much of the valley region in the northern part of the county, where the best evidences of glaciation exist to-day. The ice carried with it bowlders and more or less finely divided material coming from granite, quartzite, and other rocks. This material was deposited and largely reworked by the action of water flowing from the melting ice as it retreated. The soils over the region affected by glacial action have been formed from this heterogeneous material, some of it as laid down by the ice, some of it as deposited by glacial streams, and some of it as laid down in glacial lakes that have since disappeared or receded from a part of their beds.

[1] Kootenai County adjoins Spokane County, Wash., on the west. Along the western boundary of the county a few small, narrow areas of the Narcisse fine sandy loam join with the Springdale coarse sandy loam, light phase, and with the Colville fine sandy loam, dark subsoil phase, of the Spokane County survey. Also a few small, narrow areas of Caldwell silty clay loam in Kootenai County join with the Palouse silt loam of Spokane County. These discrepancies are due to the fact that in the Spokane County survey the areas of the Narcisse fine sandy loam, while recognized as representing Narcisse material, were, owing to their small extent, included with associated types; and the areas of Caldwell silty clay loam occurring along the boundary in Spokane County were for similar reasons included with the associated Palouse silt loam.

Wind-laid deposits cover considerable areas in the southern part of the county. These deposits give rise to important soils. Alluvial deposits occurring principally in the valley of the Coeur d'Alene River, but also in narrow strips along the small streams, form a part of the surface of the county.

These various consolidated and unconsolidated rocks are the sources of materials giving the soils of the county. The soils are classified in series, a series consisting of soil types that have a common origin and mode of formation and similar color. The series is divided into types on the basis of difference in texture, which is determined by the proportions of particles of different sizes composing the soil. Fourteen soil series, embracing 20 soil types and 11 phases, and 6 classes of miscellaneous materials are found in Kootenai County.

On the basis of differences in the manner of accumulation of the soil materials, the agricultural soils of the county may be grouped as follows: (1) residual soils, or soils derived from consolidated rocks; (2) soils derived from ice-laid glacial drift; (3) soils derived from water-laid glacial materials, including (*a*) glacial outwash and (*b*) glacial-lake deposits; (4) soils derived from wind-laid materials; (5) soils derived from recent alluvial deposits; (6) soils derived largely from the accumulation of organic material. In addition, five nonagricultural, miscellaneous materials are mapped.

In the residual group are included soils of the Moscow, Huckleberry, and Underwood series.

The surface soil of the types in the Moscow series ranges in color from brown to light brown or slightly yellowish brown. The subsoil, which is a lighter shade of brown or yellowish brown than the soil, is generally coarse and gritty and in places grades into the disintegrating bedrock within the 3-foot profile. Subangular bowlders and stones are found here and there on the surface. The soils of this series are derived from granite, gneiss, and mica schist. The topography ranges from smooth and gently rolling to hilly and rough. Drainage is usually good, and in places excessive. The series is developed under conditions of moderate to moderately heavy rainfall and the material is well leached and noncalcareous. The Moscow loam and a steep shallow phase of the type occurs in Kootenai County.

The surface soils of the types included in the Huckleberry series are light grayish brown to yellowish brown in cultivated fields, but in virgin forest areas the immediate surface is dark brown in places, owing to the accumulation of vegetable matter. The subsoil is light brown or light yellowish brown to pale yellow or gray, and is lighter in color and more compact than the surface soil. The subsoil is underlain by bedrock at various depths, ranging from 15 inches to 3 feet or more. The soils of this series are derived mainly from quartzite and shale, but to some extent from sandstone. Much of the

area in which this series occurs is so steep that only the lower slopes and more gently rolling areas have a soil covering. Fragments of the parent rock are encountered in the soil material. In most places the drainage is good to excessive. The silt loam of this series and a steep shallow phase are mapped.

The types included in the Underwood series have brown or rather dark-brown to reddish-brown soils and a somewhat lighter brown, more pronounced reddish-brown, or grayish-brown subsoil, more compact than the surface soil. These soils are mainly residual, being derived from the Yakima basalt, but as mapped in Kootenai County they contain a considerable proportion of wind-laid material. The series occurs principally on smooth, gentle slopes underlain by sheets of basalt. Both surface soil and subsoil are generally well leached and free from lime. Only one type, the Underwood loam, is mapped in the present survey.

The soils derived from glacial till are included in the Loon, Kootenai, and Clayton series.

The surface soils of the types in the Loon series range in color from light yellowish gray or light yellowish brown to pale yellow. The subsoil is yellowish gray or yellowish brown to pale yellow, carries a large proportion of unassorted gravel, stone, and sand, and is in places quite compact, though generally porous and permeable. The soil of this series is formed from glacial till consisting of materials derived from granite, quartzite, and quartz. Large granite bowlders are present in the surface soil in many places. The topography ranges from smooth and gently rolling to rolling or hilly. The drainage is good and in places excessive, owing both to the topography and the porous subsoil. Surface soil and subsoil are well leached and free from accumulations of lime. The Loon very fine sandy loam and the Loon silt loam, with a gravelly phase, are mapped in this county.

The surface soils of the types in the Kootenai series are decidedly yellow in color, varying from pale yellow to brownish yellow. The upper subsoil is yellowish brown to pale yellow and similar in character to the surface soils. The lower subsoil is porous and consists mainly of poorly assorted loose stone, gravel, and sand. The soils of this series consist of slightly weathered glacial till which is derived from a variety of rocks, principally granite, quartzite, and quartz. The surface material of the till appears to be mainly ice-laid, but the underlying material, at least in part, has been modified by the action of water. The soils are loose and porous, gravelly and stony in places, low in organic matter, and free from accumulations of lime. This series differs from the Loon series mainly in the more porous nature of the subsoil and the more uniformly yellow color of the soil material. The topography is gently rolling to hilly and is typical of

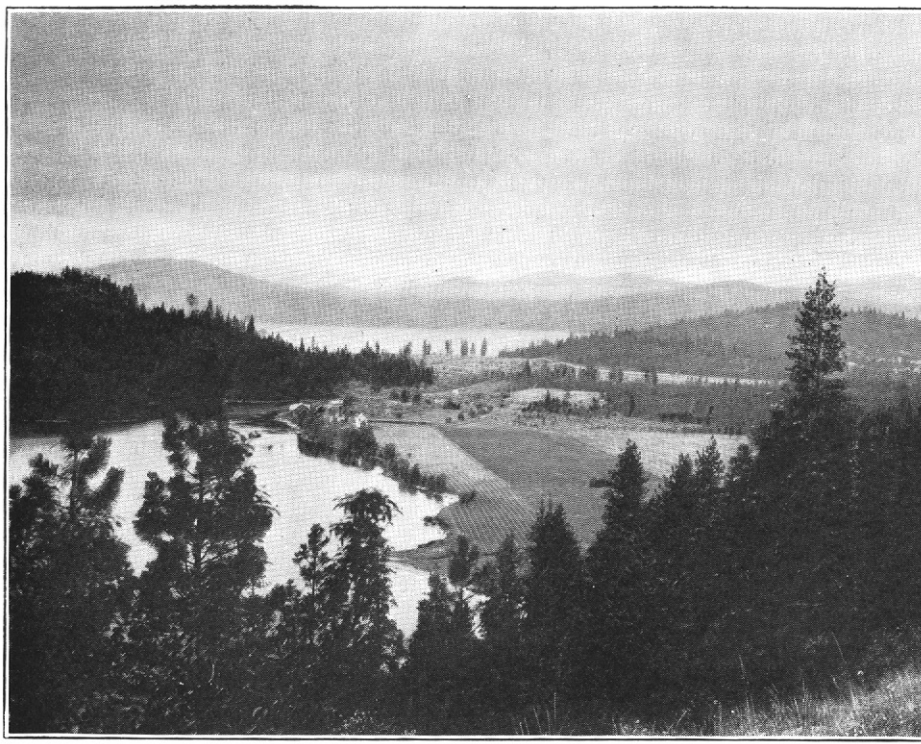
glaciated areas, consisting of rounded knolls, knobs, and elongated ridges. In places potholes are of common occurrence. The drainage is good to excessive, owing largely to the porous nature of the substratum. The Kootenai gravelly silt loam, with a stony phase, is developed in the present survey.

The surface soils of the types in the Clayton series are grayish yellow or brownish yellow to pale yellow in color and very loose and porous in structure. The subsoil is usually of more pronounced yellow or yellowish-gray color than the soil, or is mottled yellow and gray. The material consists mainly of compact stratified deposits. Layers of a rather sandy nature are encountered, but the lower part is usually more compact, being a silt, silty clay, or clay in texture. Little or no stone or gravel is present in the soils of this series, except a few glacial bowlders found mainly on the surface. The soils are deficient in lime and organic matter. The series is derived from old waterlaid deposits, mainly of glacial origin, over which appears to have been superimposed, at least in places, a relatively thin layer of ice-laid materials. The topography is smooth to gently sloping. Surface drainage is well established, but subdrainage is usually hindered by the compactness of the subsoil. Only the silt loam of this series is developed in the county.

The soils derived from glacial outwash deposits are grouped in the Garrison and Springdale series.

The surface soils of the Garrison series are rather dark brown to nearly black in color and friable in structure, and generally contain small rounded gravel. The subsoil is brown to light brown in color, becoming light grayish in places in the deeper part, and contains considerable gravel. The substratum consists of stratified sand and gravel. The surface soils are deficient in lime, relatively high in organic matter, and fairly retentive of moisture. The soils of this series are derived from deep glacial outwash deposits, the materials of which are derived from a variety of rocks, including granite, quartzite, shale, and schist. The topography is generally smooth to gently rolling. The Garrison soils differ from the related Springdale soils in their darker color, which is due largely to the fact that they are developed mainly in prairie regions. The Garrison gravelly loam, with a stony phase and a heavy phase, and the coarse sandy loam are developed in the county.

The surface soils of the types in the Springdale series are typically light brown, grading into light yellowish brown and in places into slightly grayish brown. The subsoil is light yellowish brown to light grayish brown and is underlain at shallow depths by a substratum composed almost entirely of porous, assorted gravel and sand. The soil is low in organic matter and is noncalcareous. Most of the types of this series contain fine gravel in the surface soil. The



TOPOGRAPHY IN THE VICINITY OF COEUR D'ALENE.

Lake Fernan at left. Springdale soils in the center. Coeur d'Alene and Coeur d'Alene Lake beyond. Rou
ground. Drop or break in immediate foreground represents Scabland.

TOPOGRAPHY NEAR FRENCH CANYON.

Springdale soil in the foreground. Wind-laid Helmer soil on the higher land, occupied in part by apple and ch
land in the background.

soils of this series are derived from materials laid down as glacial outwash and glacial-stream deposits, but as mapped in this area they include small bodies of recent alluvial fan deposits along the Spokane River, which represent reworked and redeposited glacial outwash materials. The topography varies from smooth to gently undulating or slightly hummocky. The surface drainage is fairly well developed and subdrainage is excessive. The soils are inclined to be droughty. This soil series was developed under a forest cover and differs from the Garrison series mainly in its lighter color. The Springdale series is represented in Kootenai County by the gravelly loam with two phases—the gravelly silt loam, the coarse sandy loam with one phase, and the very fine sandy loam.

The soils derived from the glacial-lake deposits are classed in the Colville series.

The surface soils of the Colville series are dark brownish gray, or dull brown to nearly black, mottled in places with rusty brown, and have a high content of organic matter. The subsoil is typically dark gray to light gray or slate colored, generally mottled with iron stains, heavy in texture, and plastic in structure. In virgin areas the soil has a surface covering of 1 to 3 inches of partly decomposed vegetable matter. The series occupies level to gently sloping beds of comparatively recent lakes and low-lying, poorly drained areas in the Coeur d'Alene Valley. The soils of this series are usually treeless, well leached, and noncalcareous. The Colville silty clay, with a heavy phase, was mapped.

Soils derived from wind-laid deposits, which cover a large area in the southern part of the county, are grouped in the Palouse and Helmer series.

The surface soils of the types in the Palouse series are dark brown to nearly black in color. The subsoil is lighter brown and compact, and is underlain by a subtratum of yellowish-brown to slightly grayish brown loessial material. The surface soils are high in organic matter and are darkest in color when in a moist condition. The surface soil is well leached, but the lower subsoil in places is slightly calcareous. The topography is smooth and gently rolling to hilly. Drainage is well developed. The soil material consists of fine silty loesslike material, which has been transported long distances by winds. The Palouse series represents the dark-colored prairie soils of wind-laid origin. The silt loam, with a terrace phase, is mapped in this county.

The surface soils of the Helmer series range from light brown or yellowish brown to brownish gray or yellowish gray in color. The upper subsoil or subsurface layer is a decided gray to slightly brownish gray and the lower subsoil light brown to yellowish brown. The upper subsoil is compact, but the material becomes more friable

in the lower part of the 3-foot section. The soils are low in organic matter, are well leached, and noncalcareous. The topography is gently rolling to undulating, with some steeper slopes along the margin of Coeur d'Alene Lake. This series is similar to the Palouse series in origin, but was developed under forest conditions and consequently has lighter colored soils. The Helmer silt loam is the only type of the series mapped in Kootenai County.

Soils in the recent-alluvial group have been classified in the Narcisse, Caldwell, and Chamokane series.

The Narcisse series is characterized by dark grayish brown or dark brownish gray surface soils. They contain a relatively large quantity of organic matter and may be almost black when moist. The subsoil is similar to or a somewhat lighter brown than the surface soil. In texture and structure it is commonly similar to the surface soil, or it may consist of various strata. The Narcisse soils, as mapped in Kootenai County, are derived principally from material washed from the Moscow soils, which occupy the adjacent upland slopes. They commonly have rather poor drainage. They are well leached and low in lime carbonate. The fine sandy loam of this series is mapped.

The surface soils of the types included in the Caldwell series are dark grayish brown to dark brownish gray or nearly black, usually free from stone or gravel, and relatively high in organic matter. The subsoil is grayish yellow or gray in the upper part, and more uniformly gray in the lower part, though mottled in places. The subsoil is commonly rather compact. The soils occupy rather poorly drained prairie bottom lands along the small streams in the southwestern part of the county. They are well leached and low in lime carbonate. The topography is smooth to gently sloping. The soil material represents recent alluvium washed principally from the Palouse soils, with some material derived from the Helmer soils. The Caldwell silty clay loam is mapped in this county.

The Chamokane series includes types with light-brown soils and a light-brown or brown subsoil. As occurring in this survey, however, the surface soils are of grayish to rather dark grayish brown color, and the subsoil yellowish gray to gray, mottled with yellow and rusty brown. The lower part of the 3-foot section is more yellow than the upper part. The series occupies flat, smooth, gently sloping bottom lands subject to overflow. The soil material consists of alluvial sediments transported by streams from soils derived principally from rocks of the Belt series, consisting of shale, quartzite, and sandstone. Two types, the Chamokane fine sandy loam and silty clay loam, were mapped.

Besides the series described the map shows areas of Muck and Peat. These soils, resulting from the decay and accumulation of organic

material, are found in small poorly drained areas. The vegetable matter represents remains of aquatic and marshland plants and the soil is either Peat or Muck, depending on the stage of decomposition.

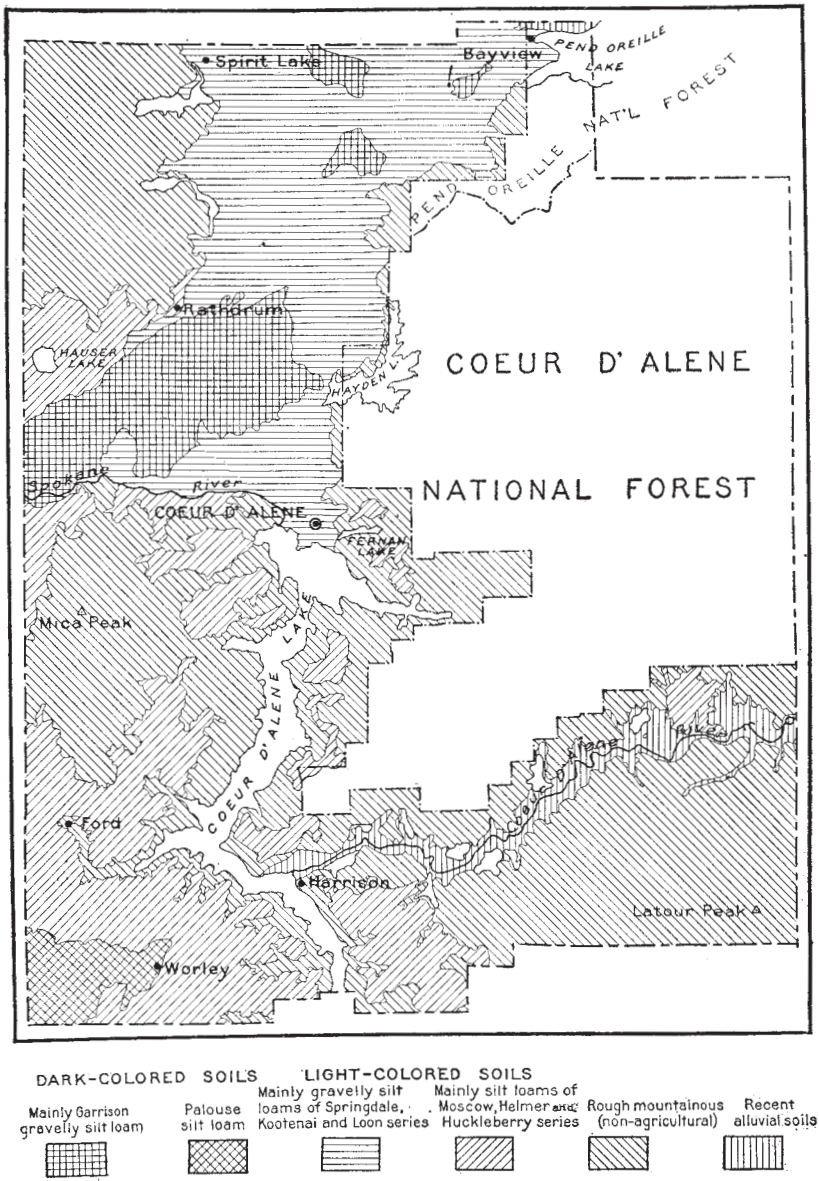


FIG. 2.—Sketch map showing distribution of the main soil groups.

Areas of nonagricultural lands also are shown. These lands are mapped as Rough stony land, Rough broken land, Rough mountainous land, Scabland and Riverwash. Nonagricultural land constitutes a large proportion of the county, and includes all of the mountainous areas.

Figure 2 shows the distribution of the soils grouped on the basis of color broadly into light-colored soils and dark-colored soils. The light-colored group includes the soils of the Moscow, Huckleberry, Loon, Kootenai, Clayton, Springdale, Helmer, Caldwell, and Chamokane. The dark-colored group consists of the soils of the Underwood, Garrison, Colville, Palouse, and Narcisse series. Four series of soils derived from glacial material, the Kootenai, Loon, Garrison, and Springdale, are characterized by gravel substrata. The soils of the Moscow, Huckleberry, Loon, Kootenai, Clayton, Garrison, Springdale, and Chamokane series are low in organic matter. The soils of the county are deficient in lime, as indicated by field tests.

The following table gives the names and the actual and relative extent of the several types in the county:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Rough mountainous land	198,464	33.5	Springdale coarse sandy loam	5,056	1.3
Helmer silt loam	65,216	12.6	Gravelly phase	1,408	
Garrison gravelly loam	30,656	8.7	Muck and Peat	4,992	1.0
Stony phase	13,824		Loon silt loam	2,176	1.0
Heavy phase	256		Gravelly phase	2,816	
Springdale gravelly loam	28,032	6.5	Chamokane fine sandy loam	3,584	.7
Alluvial-fan phase	4,224		Underwood loam	2,368	.5
Stony phase	1,472		Rough stony land	2,368	.5
Moscow loam	18,176	6.5	Chamokane silty clay loam	2,304	.4
Steep shallow phase	15,552		Rough broken land	2,112	.4
Scabland	27,456	5.3	Caldwell silty clay loam	1,984	.4
Springdale gravelly silt loam	24,256	4.7	Clayton silt loam	1,792	.3
Kootenai gravelly silt loam	10,688	4.2	Loon very fine sandy loam	1,600	.3
Stony phase	10,816		Springdale very fine sandy loam	1,280	.2
Huckleberry silt loam	7,296	2.2	Narcisse fine sandy loam	1,152	.2
Steep shallow phase	3,904		Garrison coarse sandy loam	576	.1
Palouse silt loam	9,472	1.9	Riverwash	512	.1
Terrace phase	256		Total	515,840	.....
Colville silty clay	7,552	1.5			
Heavy phase	192				

MOSCOW LOAM.

The surface soil of the Moscow loam consists of 10 to 15 inches of light-brown to yellowish-brown loam carrying fine mica particles, relatively large quantities of silt, and an occasional rock fragment. The subsoil is a lighter brown or slightly grayish brown loam. It has a high content of coarse gritty material derived from partly decomposed granite and schist, numerous rock fragments, and particles of mica. The subsoil is noticeably more compact than the surface soil. Bedrock is encountered at depths ranging from 20 to 36 inches.

In a few places the surface soil is darker colored than typical, owing largely to the accumulation of organic matter. Typical areas are developed north of Mica Creek, but south of this, with the gradual approach to the wind-laid soils of the Helmer series, the soil is in places browner. Small areas of dark-colored material lying 1½ miles northwest of Bellgrove, and probably belonging to the Colville series, are included with this type, owing to their small extent. Some of the material is also somewhat lighter in texture than typical, and here the type approaches a sandy loam.

The Moscow loam is found on the foothills and uplands of the western part of the county. The soil material is mainly residual from granite, gneiss, and mica schist, with which has been mixed some wind-deposited silt. The topography ranges from smooth and gently rolling to steep and hilly (Pl. III, fig. 1). The drainage is good and in places excessive.

Originally the type supported a growth of tamarack, yellow pine, and fir. Much of it has been cleared, and the more favorable areas are under cultivation. Grain, hay, and potatoes are the principal crops. Wheat and oats do fairly well on this type, wheat yielding 12 to 15 bushels per acre, and oats 25 to 30 bushels. Peas and oats grown as a forage crop do well. Some fruit is grown on most of the farms. Live stock raising and dairying are also carried on.

The soil of this type is deficient in lime and organic matter. It can be built up by the application of manure and by the growing of green-manure crops. Land values are quite variable, ranging from $20 to $40 an acre.

Moscow loam, steep shallow phase.—The Moscow loam, steep shallow phase, comprises the steeper hilly and mountainous areas of the Moscow loam. The soil material is similar to that of the typical loam, the surface soil being a light-brown to yellowish-brown loam and the subsoil a gritty to fine partly decomposed granitic material of compact structure. The soil material is quite shallow, bedrock is usually encountered at depths of 6 to 15 inches, and rock outcrops are common.

Only a small part of this phase is under cultivation. A large part is in forest, consisting of yellow pine, tamarack, and fir; some of it is cut-over land. As a whole this phase is too steep, broken, and shallow for farming. It is somewhat better adapted to forestry and has some value for grazing. The land is excessively drained.

HUCKLEBERRY SILT LOAM.

The surface soil of the Huckleberry silt loam is a light-brown or yellowish-brown to grayish-brown silt loam 10 to 12 inches deep. In a few places the surface soil is darker colored, owing to a higher

humus content. The soil is quite loose, and in places carries small angular fragments of shale and quartzite. The subsoil is lighter in color, a brown, yellowish brown, or pale yellow, or in places gray. It is more compact than the surface soil and over most of the area extends to a depth of 36 inches or more, although in places bedrock is encountered at 20 to 30 inches. It commonly contains fragments of shale and quartzite. The type is uniform in color and texture, except where it occurs in close association with the Helmer silt loam, into which it merges. Included with the type are areas of Huckleberry stony silt loam too small to be shown on the map, and some small patches of rock outcrop.

The type is not very extensive in this country. It occupies the lower slopes and foothills of the Coeur d'Alene Mountains east of the Rathdrum Prairie, and small areas in the eastern part of the county.

The soil material is derived mainly from quartzite, shale, and sandstone. It has, however, been modified to some extent by the addition of fine-textured wind-laid material. A more detailed examination would perhaps reveal some ice-laid material in areas along the Coeur d'Alene River valley. The areas on Folson Ridge between Blue and Wolf Lodge Creeks include some till material in the soil, but as the larger part appeared to be residual, these areas were included with the Huckleberry soil.

The type occupies the lower slopes and foothills of the Coeur d'Alene Mountains in the east-central part of the county. The topography ranges from comparatively smooth or gently rolling to hilly and broken. The elevation ranges from 2,350 to 2,700 feet above sea level.

Much of the type is forested or in the cut-over state. A small part is farmed. Wheat, oats, and hay are the principal crops. Some corn is grown for ensilage. Wheat yields from 12 to 20 bushels per acre. Considerable live stock is raised, as there is open range located near. Land values range from $10 to $35 or more an acre, varying with improvements and nearness to markets.

Huckleberry silt loam, steep shallow phase.—The steep shallow phase differs from the typical Huckleberry silt loam only in being steep and shallow, the depth ranging from 6 to 15 inches only. Outcrops of the underlying shale and quartzite are common.

The steep, mountainous topography of this phase is not favorable for farming, and practically none of the land is under cultivation. It is in forest or has been cut over, and is used only for pasture and for the production of lumber.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Huckleberry silt loam:

Mechanical analyses of Huckleberry silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540827	Soil	1.9	2.6	0.8	10.4	28.2	50.3	5.9
540828	Subsoil	.6	1.7	1.0	14.0	33.8	43.2	5.8

UNDERWOOD LOAM.

The surface soil of the Underwood loam, where typically developed, is a light-brown to reddish-brown loam, 10 to 12 inches deep. The subsoil is normally a somewhat lighter brown or a more pronounced reddish brown than the soil, but is grayish in places, and it is more compact than the surface soil. The underlying basalt rock is usually encountered within the 3-foot section and outcrops are common over small areas. In areas where the rock lies within 10 or 15 inches of the surface the soil is reddish brown in color.

The type is not extensive in this county, being found principally along both sides of Coeur d'Alene Lake. Narrow strips occur in many places just above the "break" or drop from the high upland country to the lake. Farther back from the "break" the soil is deeper and is modified by or covered with wind-laid material.

The type is mainly residual in origin from basalt rock, but contains some wind-laid material. The topography is smooth to gently sloping. Land of this type is farmed to wheat, oats, and hay. Wheat yields 15 to 20 bushels and oats 20 to 30 bushels per acre. Some fruit is grown.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Underwood loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540821	Soil	5.4	8.9	3.9	12.2	13.4	39.6	16.7
540822	Subsoil	2.8	6.4	3.2	11.3	16.5	38.7	21.4

LOON VERY FINE SANDY LOAM.

The surface soil of the Loon very fine sandy loam consists of 10 to 15 inches of light yellowish brown or pale-yellow to yellowish-gray very fine sandy loam, carrying little or no stone or gravel. The

subsoil, to a depth of 36 inches or more, is light grayish yellow or yellowish-brown to pale-yellow very fine sandy loam. A grayish color is quite pronounced locally. In places the subsoil carries considerable quantities of stones and rounded gravel and is quite compact. In general this type is deeper than the Loon silt loam occurring in this county, the stone and gravel substratum in many places lying below the depth of 3 feet. The type is relatively uniform in texture.

The Loon very fine sandy loam is developed principally north of Hayden Lake and is of small extent. It is derived from glacial till, with some modification from admixture of wind-laid material. The topography is smooth to gently rolling, and the drainage is good.

Originally all the type was in forest. It now supports several prosperous farms and practically all of it is desirable for farming, although the cost of clearing the forested areas is high. Wheat, oats, corn, hay, and potatoes are grown, with some fruits and vegetables. Grain crops do well. This type warms up early in the spring and vegetables and berry crops thrive. Corn is cut for silage. Considerable numbers of live stock are raised, and the forage crops are usually fed on the farm.

The soil is deficient in lime and humus. Barnyard manure and green-manure crops should be plowed under. Summer fallowing and dry-mulch tillage will help to preserve the moisture.

Land of the Loon very fine sandy loam sells for $10 to $50 or more an acre, the higher prices obtaining for land under cultivation and well improved.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Loon very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540805	Soil	0.3	1.7	1.7	17.1	27.9	39.0	12.4
540806	Subsoil	.3	2.0	2.1	28.3	30.5	31.5	5.3

LOON SILT LOAM.

The surface soil of the Loon silt loam is a grayish-yellow to pale-yellow silt loam, 10 to 12 inches deep, carrying small quantities of rounded gravel. The subsoil, to a depth of 30 to 36 inches, is a grayish-yellow, yellowish-brown to pale-yellow gravelly silt loam, with a very high content of gravel in the lower part. The subsoil is more compact than the surface soil. Both the surface and subsoil are low in organic matter and lime.

This type, which is of small extent, is developed only along the Coeur d'Alene Valley in small isolated tracts. The soil is derived largely from glacial till, but the silty nature of the soil is believed to be due to the admixture of wind-laid material. The topography is smooth to gently sloping.

The greater part of the type has been cleared and is used for the production of grain, hay, potatoes, and fruits. The soil is porous and droughty, and the grain crops are comparatively light, but fruits, vegetables, and potatoes do well. Land of this type is usually farmed in conjunction with bottom lands, which are used for hay crops.

Loon silt loam, gravelly phase.—The surface soil of the Loon silt loam, gravelly phase, is a light-brown to yellowish-brown loam to silt loam, 10 to 12 inches deep, carrying rounded gravel and in places considerable quantities of stone. The subsoil, to a depth of 30 to 36 inches, is a yellowish-brown, grayish-brown, or pale-yellow gravelly loam. The subsoil in many places contains so much gravel that it can not be penetrated by the soil auger below 15 or 20 inches. In the northeastern part of the county the phase is more brown in color, and along the Coeur d'Alene Valley it is yellowish brown to pale yellow and contains a larger proportion of silt. In the latter section a few small areas mapped with the phase are more nearly a stony loam than a gravelly loam.

The phase is inextensive, occupying rather small areas on the eastern side of the Rathdrum Prairie and a few small tracts along the valley of the Coeur d'Alene River. The topography is gently rolling to steep, and most of the areas are confined to the ridge crests and steeper slopes.

The phase originally supported a growth of yellow pine, fir, and tamarack. Most of it has either been cleared or cut over, but only a small part is cultivated. It is not as desirable for farming as the typical soil, owing to its gravel and stone content and droughty character. The crops are similar to those grown on the Loon very fine sandy loam, but the yields are lighter. Land values on this phase are rather low, ranging from $15 to $35 an acre.

Below are given the results of mechanical analyses of samples of the soil and subsoil of the typical Loon silt loam:

Mechanical analyses of Loon silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540831	Soil	4.7	6.1	2.6	10.5	16.1	52.8	7.6
540832	Subsoil	4.5	8.1	4.0	12.2	18.5	44.7	8.2

KOOTENAI GRAVELLY SILT LOAM.

The surface soil of the Kootenai gravelly silt loam consists of 10 to 12 inches of brownish-yellow to pale-yellow gravelly silt loam, carrying some rounded stones. The subsoil is a pale-yellow loose, porous gravelly loam. The gravel content is so high that the soil auger can not penetrate below 18 or 20 inches. The stones and smaller gravel are principally of granite, quartzite, and quartz. The soil material consists of slightly weathered glacial till. The surface soil is deficient in organic matter.

This type, which is not extensive, occurs only in the northern part of the county. The topography is gently rolling to hilly. Potholes, knolls, and elongated ridges typical of ice-laid materials are common. The drainage is good to excessive.

Practically all the type is forest or cut-over land. Little of it is under cultivation. A few farms are situated on the better lying areas. Grain and hay crops are grown, but the yields are usually light. The type is undesirable for farming because it is deficient in humus and too porous to hold moisture during the summer months. With proper farming methods, the growing of green-manure crops, and the application of manure it can be made productive. Land of this type sells for $10 to $25 an acre.

Kootenai gravelly silt loam, stony phase.—The soil of the Kootenai gravelly silt loam, stony phase, consists of 8 to 10 inches of brownish-yellow to pale-yellow silt loam, carrying a high content of rounded stone, fine gravel, and numerous large granite bowlders. The subsoil, to a depth of 15 to 18 inches, is a pale-yellow loam, with a still higher stone and gravel content than the surface soil. The substratum is a loose, porous mass of stones and gravels.

The phase is too stony and shallow for farming, and none of it is under cultivation. It is forested or has been logged off. In origin and topography it is similar to the typical gravelly silt loam, with which it is closely associated.

The following table gives the results of mechanical analysis of a sample of the soil of the typical Kootenai gravelly silt loam:

Mechanical analysis of Kootenai gravelly silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540857	Soil	4.8	4.3	1.4	8.2	13.2	56.5	11.6

CLAYTON SILT LOAM.

The soil of the Clayton silt loam is a grayish-yellow or brownish-yellow to yellowish-brown silt loam 10 to 12 inches deep. The surface soil is porous and deficient in organic matter. The upper subsoil is

prevailingly a friable gray fine sandy clay, and the lower subsoil a yellow and gray mottled compact silty clay loam to clay. The type is generally free from stone and gravel, but in places carries some glacial bowlders.

The Clayton silt loam occurs in a narrow belt along the foothills in the vicinity of Rimrock School, north of Hayden Lake. The surface soil is derived from glacial till; the subsoil from lake-laid sediments. The latter are exposed in road cuts and deep gullies.

This type has a smooth or gently sloping to undulating surface. The surface drainage is good, but the internal drainage is retarded by the impervious subsoil.

Forested areas support a growth of yellow pine and fir. A large part of the type has been cleared and placed in cultivation. Wheat, oats, hay, potatoes, fruits, and vegetables are grown. The grain crops and potatoes produce well. Some cattle and hogs are raised. Land of the Clayton silt loam type sells for $25 to $50 an acre, depending upon improvements.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Clayton silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540803	Soil	0.2	1.5	0.8	6.3	21.5	60.2	9.5
540804	Subsoil	.0	.0	.3	4.5	17.2	57.0	21.2

GARRISON GRAVELLY LOAM.

The surface soil of the Garrison gravelly loam consists of 10 to 12 inches of dark-brown to nearly black gravelly loam to gravelly silty loam carrying much small rounded gravel, the individual fragments varying from one-fourth to one-half inch in diameter. The subsoil is a light-brown gravelly loam, underlain by stratified gravel and sand at 18 to 25 inches. The surface soil has a rather high content of organic matter, and is loose and friable.

The type occupies the broad terrace areas in the northern part of the county locally known as the Rathdrum and the Eight-Mile Prairies, and is extensive as compared with the other Garrison types. (Pl. III, fig. 2.) The topography is level or undulating to gently rolling. It is prairie land, supporting no timber, and is recognized as one of the best soils of the northern part of the county. Practically all of it is under cultivation. Wheat, oats, some rye and alfalfa, corn, potatoes, fruit, and vegetables are grown successfully. Wheat yields from 15 to 25 bushels per acre, and oats from 25 to 40

bushels. Corn is grown principally for ensilage. Irrigation is confined to areas devoted to the production of fruit and vegetables. Most of the type is dry farmed, and summer fallowing is practiced. All the type lies favorable for irrigation, and would be much more productive if irrigated.

The dry-farmed land sells for from $50 to $75 or more an acre, depending upon improvements. Irrigated tracts devoted to the growing of fruits and vegetables range in value from $200 to $400 and acre.

Garrison gravelly loam, stony phase.—The surface soil of the Garrison gravelly loam, stony phase, is a dark-brown to nearly black gravelly loam, carrying a large proportion of rounded gravel and stones. The subsoil is a lighter brown gravelly to stony loam, underlain by a porous mass of stratified gravel, sand, and stones. The surface soil of the phase differs from the typical soil only in that it is more stony. In many places it has been necessary to remove the stones from the surface before cultivation. Stone fences and stone piles are common in the cultivated areas.

Soil of this kind occurs principally in the western part of the valley region in the northern part of the county. Most of the area is similar to the type in topography, but small included areas occupy ridges or knolls, higher than the general level of the terrace lands, or steep escarpments between different levels of the terraces.

A large part of the phase is under cultivation, the crops being the same as on the typical soil, with about the same yields. The expense of putting the phase under cultivation is relatively large, but after the land has been cleared of the stones it is, with exception of the steeper areas, about as valuable as the typical soil for farming. Practically none of the steeper areas are cultivated; these are used for pasture exclusively and have a low value for farming.

Garrison gravelly loam, heavy phase.—The surface soil of the heavy phase of the Garrison gravelly loam differs from the typical Garrison gravelly loam in that it is of slightly heavier and more silty texture. It is a dark-brown to nearly black silt loam, carrying some fine gravel, and extending to a depth of 12 to 15 inches. In places the texture ranges from a loam to silt loam. The subsoil is a lighter brown to slightly yellowish brown gravelly silt loam, underlain by stratified gravel and sand, with which is mixed a small quantity of finer soil material. The soil is derived mainly from glacial outwash deposits, but the upper part has been modified by admixture of wind-laid material of silty texture.

Only a small area of this soil is developed in the county. It occurs in small patches occupying slight depressions or swales in areas of the typical Garrison gravelly loam. The topography is smooth to

nearly level. The phase is desirable farming land, and all of it is under cultivation. The crops are similar to those grown on the typical soil, with which it is farmed. It is valued at $40 to $100 an acre, but no areas are large enough to be sold separately.

The following table gives the results of mechanical analyses of samples of the soil of the typical Garrison gravelly loam and of the soil and subsoil of its heavy phase:

Mechanical analyses of Garrison gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
Typical soil:		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540839	Soil	5.7	4.7	1.6	10.3	18.9	49.4	9.2
Heavy phase:								
540837	do	.7	.9	.9	16.6	18.7	56.3	6.0
540838	Subsoil	.0	.8	.3	10.6	25.1	58.4	4.9

GARRISON COARSE SANDY LOAM.

The Garrison coarse sandy loam, to a depth of 10 to 15 inches, is a dark-brown coarse sandy loam, containing some fine gravel. The subsoil is typically a somewhat lighter brown coarse sandy loam, with considerable fine gravel in the lower part of the 3-foot section. As mapped the type includes some areas of lighter texture, the soil approximating a coarse sand. In general, the soil has a loose porous structure and contains only a moderate quantity of organic matter.

The type occurs as small isolated areas near the margin of the outwash plains, and is derived from material deposited by glacial waters. The topography varies from smooth and nearly level to rolling. Drainage is good to excessive, owing to the loose porous nature of the material.

The greater part of the type is under cultivation. Wheat, oats, corn, vegetables, and fruits give good yields, and potatoes do especially well. With proper methods to conserve the soil moisture, the type could be made more productive. Land of this type sells for $40 to $75 an acre, depending upon the location and improvements.

The following table gives the results of mechanical analysis of a sample of the surface soil:

Mechanical analysis of Garrison coarse sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540849	Soil	18.1	34.5	11.9	10.6	4.1	15.2	5.6

SPRINGDALE GRAVELLY LOAM.

The surface soil of the Springdale gravelly loam is a light-brown gravelly loam of relatively silty texture, 10 to 12 inches deep. The gravel particles vary in diameter from one-fourth to 1 inch. A few larger stones and granite bowlders are found here and there on the surface. The subsoil is lighter in color than the soil. It is a brown or yellowish-brown to grayish-brown gravelly loam, underlain by a loose porous bed of stratified gravel and sand, which commonly begins at depths of 20 to 25 inches, though in places it lies within 12 to 15 inches of the surface. The soil is loose and porous, and low in organic matter.

The Springdale gravelly loam is the most extensive of the Springdale soils. It occurs in comparatively large areas in the valley region in the northern part of the county, and in many smaller isolated areas. This type owes its origin to glacial-outwash deposits derived from a variety of rocks. The topography is smooth and gently sloping to undulating. Drainage is good to excessive, owing to the loose, porous subsoil and substratum.

The type was originally all in pine forest, but the more favorable areas have been cleared and are under cultivation. All the type is dry-farmed. Wheat, oats, corn, hay, rye, potatoes, vegetables, and fruit are the leading crops. Yields are good in favorable seasons, but in dry seasons the soil is too droughty for satisfactory yields.

Springdale gravelly loam, stony phase.—The surface soil of the stony phase of the Springdale gravelly loam is a light-brown to yellowish-brown stony loam, 8 to 10 inches deep. The subsoil and substratum consist of a mass of rounded stones, fine gravel, and sand, slightly stratified, and impenetrable by the soil auger. Many rounded glacial stones are scattered over the surface and through the surface soil, and large bowlders are common.

The stony phase is not extensive. It occurs as narrow strips along escarpments or drops between different levels of the terrace country, in close association with other Springdale soils. It is steep and broken in topography. None of the phase is farmed, but some of it is used for pasture. Its value lies mainly in its forest products.

Springdale gravelly loam, alluvial-fan phase.—The Springdale gravelly loam, alluvial-fan phase, represents included material, similar to the type in color and profile, and occupying recent fans composed of sediments deposited by intermittent streams as they debouch from the more mountainous country on to the terraces. The soil, to a depth of 10 to 12 inches, is a brown or light-brown to slightly yellowish brown gravelly loam or silty loam. The subsoil is a light-brown to yellowish-brown gravelly loam, and the substratum consists of stratified gravel, stone, and finer material. The gravel in this

phase consists principally of quartzite and shale and does not show as wide a range in the kinds of rocks as in the typical soil. The gravel is also more angular.

The alluvial-fan phase occurs along narrow stream bottoms or terraces, principally in the eastern part of the county, in association with the Huckleberry soils of the upland or with Rough mountainous land. The area along Latour Creek in the southeastern part of the county represents a stream terrace consisting principally of gravel and stones, with some soil material. The topography is smooth to gently sloping, with occasional depressions.

Only a few of the more favorable areas are cultivated, most of the phase being too stony and shallow for farming. The crops are confined to grain and hay. Hay does well where the soil is subirrigated. The alluvial-fan phase as a whole has a low agricultural value and does not command a high price.

The following table gives the result of mechanical analysis of a sample of the soil of the typical Springdale gravelly loam:

Mechanical analysis of Springdale gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540843.....	Soil.....	16.2	8.4	1.1	4.8	12.5	45.0	12.0

SPRINGDALE GRAVELLY SILT LOAM.

The surface soil of the Springdale gravelly silt loam is a light-brown or yellowish-brown to light grayish brown gravelly silt loam, 10 to 15 inches deep. The silty material is "fluffy" and loose in structure, though very low in organic matter. The subsoil is lighter yellowish brown in the upper part changing to grayish brown in the lower part. At 20 to 25 inches it grades into a slightly stratified, loose, and porous substratum, composed of rounded stones, gravel, and sand. The gravel which forms a large proportion of this soil is small, ranging from very fine particles to fragments 1 inch or more in diameter. Larger scattered granite bowlders are, however, common in the type. The texture of the fine earth is uniformly a floury silt loam.

The Springdale gravelly silt loam occupies level to gently rolling or undulating areas in the northern part of the county, near Garwood and Chilco stations, on the Spokane International Railway, and in the vicinity of Athol. It is moderately extensive, occupying about 38 square miles. It is derived from outwash-plain deposits. The surface soil probably also contains some fine wind-laid material.

Originally all the type was forested and a large part of it is still in forest or is cut-over land. Topographically the land is well suited to irrigation, but the soil is so porous that an abundance of water will be required. A small part of the type is dry-farmed at present. Wheat, oats, rye, potatoes, fruits, and vegetables are grown. The soil is droughty, and in dry seasons crops suffer, but in seasons of normal rainfall the crops, particularly potatoes, do well.

Land of this type ordinarily sells for $25 to $40 an acre, and some of the better tracts where well improved for $75 or more.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Springdale gravelly silt loam:

Mechanical analyses of Springdale gravelly silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540841	Soil	1.3	4.2	3.1	11.2	17.5	56.7	6.2
540842	Subsoil	1.3	5.1	4.4	12.5	19.1	51.4	6.4

SPRINGDALE COARSE SANDY LOAM.

The soil of the Springdale coarse sandy loam, to a depth of 10 to 12 inches, is a light-brown or light grayish brown to yellowish-brown coarse sandy loam, the sand being principally composed of basalt, but in part of quartz. The subsoil is a porous, loose, coarse sandy loam to loamy coarse sand, of a yellow to grayish-yellow color. Cuts along railroads show the coarse sandy material to extend to a depth of 20 to 50 feet. The lower subsoil is stratified. The soil is deficient in lime and organic matter.

This type is not extensive; it occurs near Coeur d'Alene and near Hauser Lake, and in small isolated bodies in other parts of the survey. It is derived from glacial outwash deposits. The topography is for the most part smooth to slightly undulating, but some more rolling areas are included. The natural drainage is excessive, the power of the soil to hold moisture being low.

The Springdale coarse sandy loam in its virgin state supports a growth of yellow pine and fir. The more favorable areas have been cleared and put under cultivation. The type is dry-farmed, there being no water available for irrigation. Grain, hay, potatoes, fruit, and vegetables are grown. Potatoes, fruit, and vegetables do well. Yields of grain and hay crops are rather light, as the moisture is not sufficient for good yields. The type ranges in value from $30 to $75 an acre.

Springdale coarse sandy loam, gravelly phase.—The surface soil of the gravelly phase of the Springdale coarse sandy loam is a

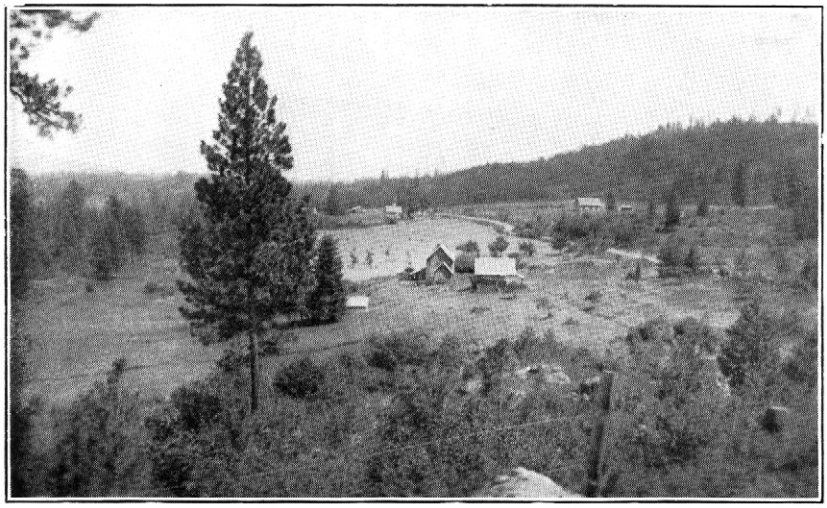


FIG. 1.—TOPOGRAPHY AND FARM BUILDINGS ON THE MOSCOW LOAM NEAR COEUR D'ALENE.

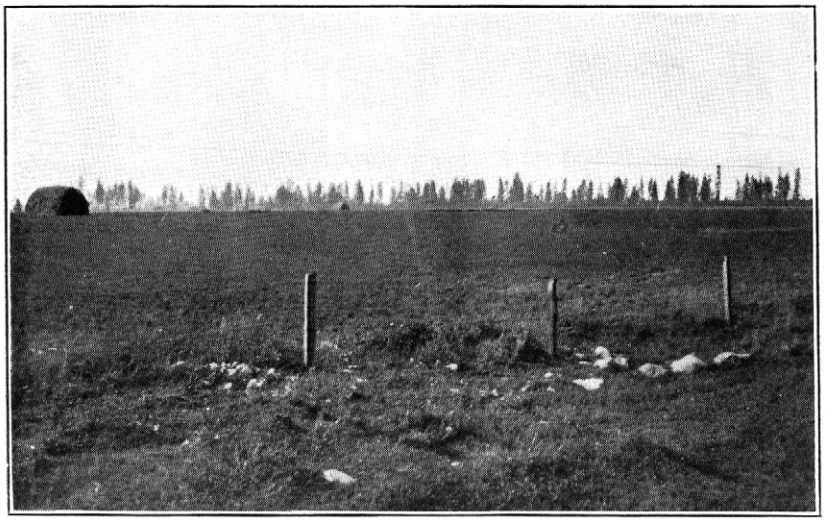


FIG. 2.—GARRISON GRAVELLY LOAM ON EIGHT MILE PRAIRIE.

Showing smooth and nearly level topography. The crop in this field is alfalfa, grown under irrigation. Forest on Springdale soils in the background.

FIG. 1.—PALOUSE SILT LOAM ON ROLLING PRAIRIE.

About 3 miles west of Worley, in the southwestern corner of the county. Winter wheat in the foreground

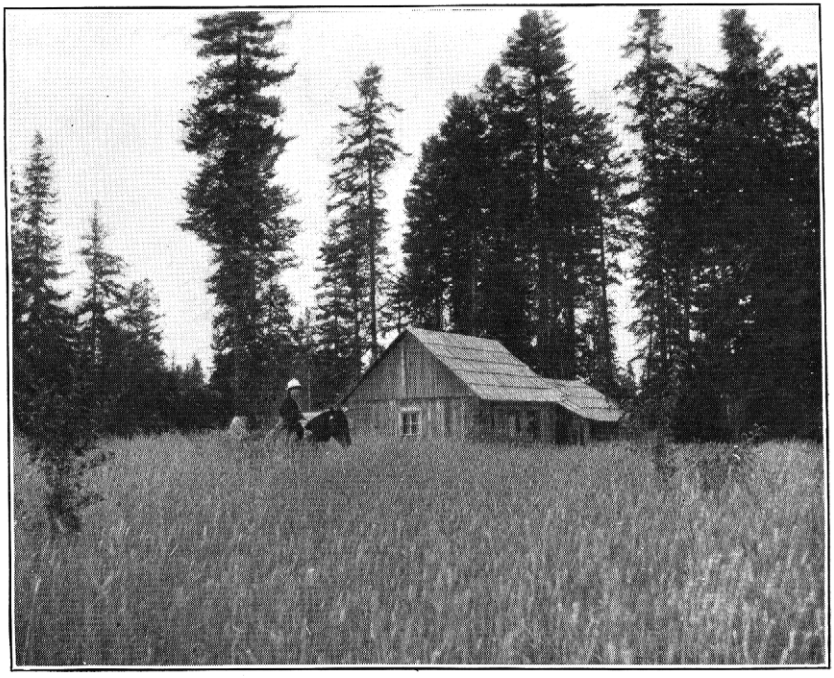


FIG. 2.—VIRGIN SOIL OF THE HELMER SILT LOAM.

First crop of spring wheat on newly cleared land.

light-brown or yellowish-brown to slightly grayish brown coarse sandy loam, carrying much fine gravel, extending to a depth of 10 to 12 inches. The subsoil is a light-brown to yellowish-brown gravelly coarse sandy loam, which is underlain by stratified gravel and sand at depths of 18 to 25 inches. The soil material of this phase is not so deep as the typical Springdale coarse sandy loam, the gravel substratum appearing within the 3-foot section. The soil has a low content of organic matter, and is porous and droughty.

This phase is similar to the type in origin. It occupies smooth and nearly level to gently rolling areas of small extent in the valley proper and on the high bench land in the vicinity of Hauser Lake on the western side of the valley region. Some of the phase is under cultivation to crops similar to those grown on the typical soil, but the yields are somewhat lighter.

Below is given the result of a mechanical analysis of a sample of the surface soil of the typical Springdale coarse sandy loam:

Mechanical analysis of Springdale coarse sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540833	Soil	9.9	37.8	10.3	8.7	6.9	21.6	4.7

SPRINGDALE VERY FINE SANDY LOAM.

The surface soil of the Springdale very fine sandy loam is a fine to very fine sandy loam, light brown to yellowish brown in color, 12 to 15 inches deep, and normally without gravel. The subsoil is a lighter brown to yellowish-brown fine sandy loam, which is typically quite gravelly below the depth of 25 to 30 inches. Some of the material included with this type is of silty texture and represents undifferentiated areas of Springdale silt loam.

The type is inextensive in the county, occurring as small, narrow, areas, which occupy slight depressions or swales along or near the margin of areas of other Springdale soils. The topography is smooth and nearly level. The type is similar in origin to the other Springdale soils. Only a small part is cultivated. It is formed in conjunction with associated Springdale soils and produces good crops.

COLVILLE SILTY CLAY.

To a depth of 12 to 18 inches the Colville silty clay is a dark-gray or dark brownish gray to nearly black silty clay. In places the immediate surface contains considerable organic matter and has a peaty and mucky character. The subsoil is a dark-gray or gray to drab, mottled, plastic silty clay extending to a depth of several feet.

Little or no stone or gravel is present in the surface or subsoil material. In places along the low-lying arms of Coeur d'Alene Lake and other smaller lakes, the lower part of the subsoil has a white, ashy appearance and is high in organic matter.

The type occupies low and frequently submerged poorly drained areas in stream valleys, low-lying glacial-lake basins in the Hauser Lake section, and recently exposed beds in the arms of lakes. The largest areas lie in the valley of the Coeur d'Alene River, but the type occupies many other isolated areas in the county.

The soil is derived from recent lake-laid sediments or from recently exposed materials which were deposited in shallow water. This material has its origin in a variety of materials, but comes mainly from glacial till and from wash derived from the Belt series of rocks in the southeastern part of the county. In places there has been some overwash of recent alluvial materials, but this has not influenced the type to any great extent, as the surface mantle of peaty material is usually intact. The areas in the Coeur d'Alene Valley have been slightly modified by admixture of alluvial deposits.

This soil type, when properly drained, produces good crops of grain and hay. The virgin soil produces wild grasses that are cut for forage. A large part of the type is subject to frequent overflow and remains in a semiswampy condition too much of the time to be very productive. Most of the areas along Coeur d'Alene Lake and in the Coeur d'Alene Valley lie below the level to which the water may be held by the dam of the water power company drawing power from the Spokane River at Post Falls. Such land, lying below 2,126 feet, the level of Coeur d'Alene Lake, does not have much future for crop production. The better-drained areas mapped elsewhere in the county and lying above this level (2,126 feet) are desirable for farming. The type makes excellent hay and oats land. The better drained and better developed areas of this type sell for $50 to $100 an acre.

Colville silty clay, heavy phase.—The heavy phase of the Colville silty clay represents a development of Colville clay, which, owing to its small extent, has been included as a phase of the silty clay type.

The surface soil to a depth of about 15 inches is a dark rusty brown to nearly black clay which clods if tilled when too wet or too dry. It is high in organic matter. The subsoil to a depth of 3 feet or more is a drab, mottled with ocherous yellow, heavy plastic clay. The drainage is poor, owing to the flat topography and the plastic, impervious nature of the subsoil.

This phase occurs in a narrow strip in a depression south of Rimrock School, and in two other very small areas south of Hayden Lake at the edge of the upland country. The surface is smooth and

nearly level. The soil material is similar in origin to that of the typical Colville silty clay, but probably has been influenced to a greater extent by stream-laid materials derived from the upland.

The larger part of the phase is under cultivation to grain and hay. Oats do well, and timothy hay yields from 2 to 2½ tons per acre. All of the phase is considered good farming land, and with proper drainage can readily be made productive. It is farmed in conjunction with the adjacent soils. Values range from $25 to $75 an acre.

Below are given the results of mechanical analyses of samples of the soil and subsoil of the Colville silty clay and its heavy phase:

Mechanical analyses of Colville silty clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
Typical soil:		*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540825	Soil	0.0	0.7	0.4	1.7	1.8	54.4	41.0
540826	Subsoil	.2	.4	.2	1.7	1.0	55.0	41.4
Heavy phase:								
540801	Soil	.0	.7	.4	1.9	2.5	21.4	73.1
540802	Subsoil	1.4	1.8	.5	1.0	2.8	29.6	63.0

PALOUSE SILT LOAM.[2]

The soil of the Palouse silt loam, to a depth of 12 to 15 inches, is a very dark brown to nearly black silt loam, containing a relatively large quantity of organic matter and a noticeable amount of small mica particles. The subsoil is lighter brown and more compact than the soil, and ranges in texture from silt loam to silty clay loam. The type is comparatively uniform in color and texture.

The Palouse silt loam is confined to a few square miles of the elevated prairie region, known as the Palouse Country, in the southwestern part of the county. The topography is rolling to hilly (Pl. IV, fig. 1). In its virgin condition the type supported a growth of grasses. Practically all its area is farmed at present. Wheat, oats, and peas and oats mixed are the principal crops. Wheat predomi-

[2] The Palouse silt loam mapped in this area lies on the eastern margin of a large area covering much of eastern Washington. Throughout the greater part of its extent in Washington this soil differs in some respects from the soil mapped as Palouse silt loam in Idaho, although its eastern margin in Spokane County, Wash., seems to be essentially like the soil in Kootenai County. In Washington the soil is somewhat darker in color than the soil mapped Palouse in Kootenai County, but the greater difference lies in a characteristic due to differences of rainfall in the two regions. This characteristic consists of a zone or layer of lime carbonate which is universally present in the subsoil of the greater part of the area of the Palouse in Washington and its absence in the subsoil of the eastern margin of the Washington areas as well as in the Kootenai area. This is an important distinction and if it proves to characterize considerable areas of the prairie soils of the northwest it will be recognized in future mapping. The reader should bear in mind, in reading this report, that the Palouse silt loam in this county differs from the Palouse silt loam in at least the western part of Spokane County, Wash., as described in this note.

nates and yields from 20 to 25 bushels per acre. Winter wheat is grown almost exclusively. Summer fallow has been employed in the past to store moisture in the soil and prepare it for a succeeding wheat crop, but a crop of peas and oats has displaced the earlier practice and has proved more profitable. Oats grown alone do well. This part of the Palouse Country is typically a wheat producing section. Hay is grown to a small extent, and potatoes, fruits, and vegetables are grown for home use. Potatoes do well.

Land of this type is highly valued, prices ranging from $75 to $150 an acre, depending upon the improvements and nearness to markets or transportation. It is considered the best general farming land in the county.

Palouse silt loam, terrace phase.—The surface soil of the terrace phase of the Palouse silt loam is a dark-brown to nearly black, mellow silt loam, 12 to 15 inches deep. The subsoil, to a depth of 20 to 30 inches, is a lighter brown or slightly yellowish brown silt loam to silty clay loam, more compact than the soil. The subsoil rests upon a bedrock of basalt.

The phase is inextensive in this county. It occupies a flat to slightly sloping terrace along Rock Creek in the southwestern part of the county.

The larger part of the soil and subsoil consists of wind-laid material, but the lower subsoil has been modified by material from the underlying basalt and in some of the lower lying areas by admixture of alluvial deposits.

Practically all of the phase is used in growing grain. Yields are good, but average somewhat lower than on the typical soil.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the typical Palouse silt loam:

Mechanical analyses of Palouse silt loam

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540815	Soil	0.1	0.3	0.3	2.9	17.9	61.9	6.5
540816	Subsoil	.1	.2	.2	2.4	21.8	60.2	15.2

HELMER SILT LOAM.

The Helmer silt loam, to a depth of 10 to 12 inches, is a light-brown or yellowish-brown to brownish-gray, mellow silt loam, carrying some fine mica particles. This is underlain by a subsurface or upper subsoil layer of gray compact silt loam to silty clay loam, which extends to a depth of 18 to 20 inches. This in turn is underlain by a compact silt loam or silty clay loam of yellowish-brown color, mottled with gray, extending to a depth of 25 to 30 inches. The lower subsoil to a depth of more than 3 feet is a more friable silt

loam or silty clay loam of yellowish-brown color, mottled with gray. The 3-foot soil section of the Helmer silt loam, where typically developed, is characterized by the four distinct layers or horizons described above. The better drained slopes, however, do not have the decided gray layer below the surface soil.

The soil is rather uniform in color and texture, but where it grades into the soils of the Underwood series, mapped near the slopes which descend to Coeur d'Alene Lake, a reddish tint is noticeable in the soil material, and in the zone of transition into the Moscow soils the surface soil is yellower. On the steeper slopes, where the surface soil has been removed by erosion, the distinct gray layer of the subsurface is exposed.

The type lies in the southern part of the county, where it occupies a high gently rolling to undulating plateau underlain by basalt. The topography is favorable for general farming. The type is derived from weathered eolian material deposited over the basalt. The depth of the soil material ranges from a few feet to more than 50 feet. A small area in which there are a few granite bowlders and other evidences of glacial action occurs on the flats near the Mica School.

The surface soil is friable and easily tilled, though tending to clod, however, if worked when wet. The type is fairly retentive of soil moisture. It has a moderate content of organic matter, but carries less than the Palouse soils.

Originally all the type was forested with yellow pine, white pine, fir, and tamarack. The greater part of this type was in the Coeur d'Alene Indian Reservation until 1910, when it was thrown open to settlement. Since then a large part of the forest has been cut, and the land placed under cultivation. The soil is desirable for farming, and is productive from the first. (Pl. IV, fig. 2.) The crops grown are similar to those on the Palouse silt loam, wheat being the most important product. The yields probably are lower than on the latter soil. The same cultural methods are practiced on the two soils.

The type is held at $25 to $100 an acre, depending upon improvements, nearness to markets, and amount of cultivated land.

The following table gives the results of mechanical analyses of samples of the surface, subsurface, subsoil, and lower subsoil of the Helmer silt loam:

Mechanical analyses of Helmer silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540817	Soil	0.3	1.1	0.7	4.1	17.0	65.9	10.9
540818	Subsurface	.4	1.6	.8	3.9	19.3	66.1	8.1
540819	Subsoil	.0	1.2	.8	5.2	18.4	57.8	16.7
540820	Lower subsoil.	.0	1.3	.6	6.0	18.1	56.8	17.3

NARCISSE FINE SANDY LOAM.

The Narcisse fine sandy loam, to a depth of 12 to 15 inches, is a dark grayish brown to dark brownish gray fine sandy loam, free from stone and gravel. The subsoil is a grayish-brown to brownish-gray fine sandy loam slightly more compact than the soil. The surface soil is relatively high in organic matter, and though in places slightly compact is friable when tilled. In some areas there is considerable variation in the color of the surface soil. Along Lake and Rockford Creeks the color is quite dark, and about 6 miles west of Coeur d'Alene along Cougar Creek it is decidedly gray.

This type is inextensive. It occurs as narrow bottom lands along Lake, Rockford, Cougar, and other creeks near the western boundary of the county. The soil is composed of wash from the adjacent upland types, principally of the Moscow series, carried down by the streams and deposited along their flood plains.

The areas lie only a few feet above the normal level of the streams and are subject to overflow during high water. A large part of the land is forested with fir and tamarack; some of it is farmed. Wheat, oats, timothy, hay, potatoes, and vegetables are the chief crops. The better drained areas produce good yields of grain and hay. Potatoes do well. Land of this type sells for $15 to $50 an acre.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Narcisse fine sandy loam:

Mechanical analyses of Narcisse fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540809	Soil	0.8	7.6	11.3	31.8	13.7	22.8	11.6
540810	Subsoil	.1	3.8	4.4	35.8	22.4	25.4	7.3

CALDWELL SILTY CLAY LOAM.

The surface soil of the Caldwell silty clay loam is a dark grayish brown or dark brownish gray to nearly black silty clay loam, 15 to 20 inches deep. It is free from stone or gravel and relatively high in organic matter. The subsoil is grayish yellow or gray to slate-colored and quite compact, particularly in the lower part of the 3-foot section. The type is fairly uniform in texture and color, but includes some areas of silt loam.

The Caldwell silty clay loam covers only a small total area. It is developed in small, narrow areas along creeks in the southwestern corner of the county. The topography is flat to gently sloping. The drainage is poor, owing to the flat surface and the heavy plastic

subsoil, which retards the internal movement of water. The soil material consists of alluvial deposits washed from the adjacent upland soils of the Palouse and Helmer series. Owing to the poor drainage, the soil is cold until late in the spring.

Most of this soil is open prairie, but parts along Rock Creek are forested with pine, willow, and cottonwood. The better drained areas produce good yields of grain and timothy hay. The type is used chiefly for hay production or for pasture. It is farmed and sold in conjunction with the upland soils.

CHAMOKANE FINE SANDY LOAM.

The surface soil of the Chamokane fine sandy loam is a light brownish gray to gray fine sandy loam, 12 to 15 inches deep, containing little organic matter. It is usually loose in structure, though there are a few "slick spots" that are compact. The subsoil is a yellowish-gray to gray fine sandy loam, somewhat compact in places, but for the most part friable.

Near Cataldo this type includes areas of browner material and there are included a few small areas or spots of sandy loam or fine sand texture, these being too small to be separated on a map of the scale used.

The Chamokane fine sandy loam is not extensive in Kootenai County. It occupies narrow areas on a slight elevation or natural levee along the Coeur d'Alene River. The soil material is loose and porous, which is conducive to good internal drainage, but the larger part of the type is subject to overflow during high water.

Some of the type is used for growing oats, potatoes, and fruits. The grain yields are only fair. Potatoes do well.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Chamokane fine sandy loam:

Mechanical analyses of Chamokane fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540829	Soil	0.3	0.4	0.4	23.7	34.2	35.4	5.6
540830	Subsoil	.1	.1	.6	44.7	26.6	23.3	5.0

CHAMOKANE SILTY CLAY LOAM.

The surface soil of the Chamokane silty clay loam is a brownish-gray to light brownish gray fairly compact silty clay loam, with a depth of 12 to 15 inches. The subsoil is a yellowish-gray or gray to mottled rusty brown, compact silt loam to silty clay loam, the yellow becoming more pronounced with depth. The type contains little if any lime carbonate and is deficient in organic matter.

This is a type of small extent occurring only in the Coeur d'Alene Valley. It occupies flat and smooth to gently sloping bottoms lying several feet above the normal water level of the river, and is subject to overflow. Both surface and internal drainage are poor. The soil is the result of deposition of recent-alluvial material derived from a variety of rocks, mainly quartzite, shale, and sandstone.

The type is practically treeless, except for a few scrubby pines and some willow. Only a small part is farmed. Hay is the principal crop. Some oats are grown, but the yields are light. The type is not considered desirable for farming, owing to the frequency of overflow and to the presence of lead in the sediments carried from the mines of the Wallace mining district.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Chamokane silty clay loam:

Mechanical analyses of Chamokane silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
540823	Soil	0.0	1.0	0.7	2.1	5.3	68.3	22.7
540824	Subsoil	.7	1.3	.5	1.4	6.6	73.1	16.2

MUCK AND PEAT.

Muck and Peat include areas of soil resulting from the accumulation of large quantities of vegetable matter and its admixture with a small proportion of mineral soil particles. Peat consists of partly decomposed organic matter, in which the fibrous structure of the original plants can be discerned; Muck consists of more thoroughly decayed remains of plants, in which all trace of the original structure has disappeared. The peaty material has a brownish cast, while the Muck has a decided gray to black color. The Muck and Peat were not differentiated upon the soil map in this county because of their close association and relatively small extent. Peat, however, predominates. In places the organic material has a depth of 3 to 20 feet or more.

Muck and Peat occupy low, flat, poorly drained or semiswampy areas, including basins of abandoned glacial lakes, in the northwestern part of the county, and other areas along the Coeur d'Alene River. It is locally referred to as "Meadow."

In its natural state the soil produces a rank growth of coarse wild grasses, which are cut for forage or used for pasturage. A few small willows grow in places. Some areas of Muck produce good yields of timothy and oats cut for hay.

When properly drained the type is suited to the production of hay and grain crops. In most places, however, it would be almost

impossible properly to drain the areas, especially those along the Coeur d'Alene River, which are subject to overflow. Muck and Peat lands are held at $20 to $75 an acre.

ROUGH STONY LAND.

Rough stony land comprises areas occupied mainly by rock outcrop and bowlders, with little fine soil material. The abundance of stone makes farming impracticable. The type supports a scattering growth of pines and is used for pasture.

Rough stony land is not extensive in Kootenai county. It occupies the rougher, more broken areas where the surface soil has been removed by erosion, leaving the bedrock and rock fragments exposed. The areas of finer soil material are scattering and the soil cover shallow.

ROUGH BROKEN LAND.

Rough broken land includes areas rendered nonagricultural by a steep and rough topography. It consists mainly of steep, narrow strips or escarpments between different levels of terraces in the northwestern part of the county. It is closely related to Rough stony land, but it is steeper and more broken in topography and contains less rock outcrop or fragmentary rock.

ROUGH MOUNTAINOUS LAND.

Rough mountainous land includes the highest mountain ridges and peaks as well as the rough and broken mountain slopes, and is mainly nonagricultural. The greater part is forested with yellow pine, white pine, fir, spruce, and tamarack. The areas included within the Coeur d'Alene and Pend Oreille National Forests are best suited for forestry purposes. Some grazing is afforded on the slopes.

SCABLAND.

Scabland is identified with the basaltic plateau region. It consists of areas of shallow soil accumulation, with an abundance of rock outcrop, principally basalt. It occupies irregular areas and associated steep escarpments in the benches or terraces formed by lava flows. Scabland is extensive in this county. It occurs along the east side of the valley region and on both sides of Coeur d'Alene Lake as far south as the county line. Practically none of the type is farmed.

RIVERWASH.

Riverwash consists of fine sands and other sediments occupying flood-swept positions along the Coeur d'Alene River near Cataldo. It is inextensive, and has no value for agriculture.

OCCURRENCE OF LEAD IN SOILS OF THE COEUR D'ALENE VALLEY.

The Coeur d'Alene River flows through the southeastern part of the county from Cataldo in a southwesterly direction, and empties into Coeur d'Alene Lake at Harrison. This valley region varies in width from three-fourths mile to 2½ miles. The general elevation ranges from 2,124 feet, the normal level of Coeur d'Alene Lake, to 2,142 feet at Cataldo. A power company has the right to hold the lake level to 2,126 feet. The river backwater extends as far as 2 miles above Dudley. Much of the soil along the lower part of the drainage system is below this level and is subject to overflow. In several places there are dikes or levees to protect the land against overflow. During high water these do not hold, and practically all the land in the valley region is subject to overflow from the river and backwater.

The Wallace mining district lies 8 to 20 miles up the Coeur d'Alene River. The millings from these mines are carried down by the river, and in times of overflow are deposited over the lower lying soils of the valley.

It is said that the soils of this valley are being injured through the deposition of lead contained in the débris from the stamp mills.

Samples of the Colville and Chamokane soils were analyzed for lead by the University of Idaho Agricultural Experiment Station, with the following results:

Lead analyses of valley soils.

Type.	Location of sample.	Depth of sample.	Proportion of lead in soil.
		Inches.	*Per cent.*
Chamokane fine sandy loam	½ mile west of Rose Lake		
Soil		0–15	0.34
Subsoil		15–36	.12
Chamokane silty clay loam	2½ miles northwest of Cataldo		
Soil		0–12	Trace.
Subsoil		12–36	.17
Colville silty clay	3 miles northwest of Cataldo		
Soil		0–18	None.
Subsoil		18–36	None.
Sediment[1]			2.86

[1] Deposited on plank floor during high flood of January, 1918.

The effect of leading of the soil on oats is to shorten the straw, turn it yellow and red, and greatly lower the yield. It is said that hay crops or grain produced in this valley region can not be fed to horses without danger of killing them.

There are some indications that parts of this valley region are being abandoned as farming land.

SUMMARY.

Kootenai County lies in the northern part of Idaho, commonly known as the Panhandle. The area of the county is 1,302 square miles, but practically one-third, lying within the Coeur d'Alene and Pend Oreille National Forests, is not covered by the present survey.

The county includes low flat bottom lands, gently rolling to undulating outwash plains of the northern part of the county, rolling to hilly foothills, high gently rolling plateaus, and rough mountainous areas.

The area may be broadly considered in 5 physiographic divisions: (1) the Rathdrum Prairie, or glacial-outwash plain, in the northern part of the county; (2) the rolling to hilly foothills; (3) the elevated hilly to mountainous areas; (4) the rolling prairies, or basaltic plateau, of the southern part of the county; (5) the glacial-lake and recent-alluvial bottom land.

The elevation of the area ranges from about 2,100 to 5,500 feet or more above sea level.

Practically all the county is drained by the Spokane River, which is the outlet of Coeur d'Alene Lake. A small area in the northern part drains into the Clark Fork of the Columbia River, and all the drainage of the county eventually enters the Columbia River. The larger part of the county is well drained, but the valley of the Coeur d'Alene River is subject to overflow.

The more favorable farming sections of the county are well supplied with railroads. The Northern Pacific, the Spokane International, the Chicago, Milwaukee & St. Paul, the Oregon-Washington Railway & Navigation Co., and the Inland Empire Electric lines all enter or pass through parts of the county. Boat transportation is maintained on Coeur d'Alene Lake.

The roads of the county are good.

Market facilities are good. The local towns, Spokane, Wash., and Pacific coast points constitute the principal markets for the products of the county.

The summers are characterized by warm days and cool nights. The winters as a rule are not severe, and the snowfall is usually light. The mean annual precipitation is about 25 inches and the mean temperature about 47° F. The average length of the growing season is 140 days.

The agricultural development of the county began about 1883, and the greatest advance has occurred within the last decade. Grain, hay, fruits, and potatoes are the principal crops. Truck crops are grown to supply local needs. Dairying and stock raising are becoming more important.

Twenty types of soil with 11 phases, are mapped in the county. Of these 3 types and 2 phases are classified as residual soils derived

from consolidated rocks; 4 types and 2 phases are derived from glacial till and old glacial-lake sediments; 7 types and 6 phases occupy glacial-outwash plains and recently exposed glacial-lake basins; 2 types and 1 phase are derived from eolian or wind-laid deposits; 4 types consist of recent-alluvial or flood plain deposits; and there are 6 six types of miscellaneous materials, including 1 derived from organic accumulations.

The residual soils occur mainly on the lower mountain and hill slopes in the western and eastern parts of the area surveyed.

The soils derived from glacial till occur in the northern part of the county, with small areas along the Coeur d'Alene River.

The soils derived from materials of the glacial-outwash plains and terraces are found in the northern part of the county.

The soils derived from the eolian or wind-laid materials occur mainly in the southern part of the county.

The recent-alluvial soils are found along the stream courses in the southern part of the county.

The materials derived from organic accumulations occupy small isolated and poorly drained areas, mainly in the valley of the Coeur d'Alene River. The other types of miscellaneous materials are mainly nonagricultural.

The residual soils are classified under the Moscow, Huckleberry, and the Underwood series. The Moscow soils are light brown to yellowish brown, with a yellowish-brown subsoil. The Huckleberry soils are light brown, or yellowish brown to pale yellow, with a lighter brown, pale-yellow to slightly grayish subsoil. The Underwood soils are light brown to reddish brown, underlain by a lighter brown to grayish subsoil.

The glacial till or drift soils comprise the Loon, Kootenai, and Clayton series, the latter being derived partly from old lake-laid sediments.

The Loon soils are light yellowish brown to pale yellow, with a yellowish subsoil. The Kootenai soils are yellowish brown to pale yellow in color, underlain by a pale-yellow subsoil which is more open and porous than the subsoil of the Loon series. The Clayton soils consist of yellowish-gray to yellowish-brown surface soils, underlain by a yellow and gray, mottled, subsoil, the latter being derived mainly from old lake-laid deposits.

The soils of the glacial-lake and glacial-outwash plains are grouped in the Garrison, Springdale, and Colville series.

The Garrison soils consist typically of dark-brown to nearly black surface soils, underlain by a lighter brown subsoil and a substratum of porous sand and gravel.

The Springdale soils consist of light-brown to yellowish-brown surface soils underlain by a lighter brown to yellowish-brown sub-

soil and a porous sand and gravel substratum. The Springdale soils are forested, and the Garrison soils occupy prairie areas.

The Colville series consists of dark-gray, or dark brownish gray to nearly black soils, underlain by a gray or mottled rusty-brown to drab compact subsoil. The soils are poorly drained and are derived from recently exposed lake-laid or shallow slack-water deposits.

The soils derived from the eolian, or wind-laid, materials are divided into two series, the dark-colored soils of the Palouse series and lighter colored soils of the Helmer series.

The recent-alluvial soils are divided into three series—the Narcisse, Caldwell, and Chamokane.

The Narcisse soils include types with dark grayish brown to nearly black surface soils and a lighter colored subsoil. The material is derived mainly from sediments washed from the Moscow soils.

The Caldwell types consist of dark grayish brown to nearly black surface soils, underlain by a gray to drab subsoil. The parent material is largely washed from areas of the Palouse and Helmer soils.

The Chamokane series includes brownish-gray to grayish-brown surface soils, underlain by a yellowish-gray to gray mottled rusty subsoil.

Muck and Peat consists of decomposed or partly decomposed organic matter, with an admixture of a small but variable quantity of mineral soil particles. Comparatively little soil of this kind is developed in the county.

The nonagricultural miscellaneous types or materials include Rough stony land, Rough broken land, Rough mountainous land, Scabland, and Riverwash.

The soils in the valley of the Coeur d'Alene River are subject to overflow, and as a whole are flat and poorly drained. During periods of high water tailings from the mills of the Wallace mining district are deposited over these soils, causing them to become "leaded."

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[PUBLIC RESOLUTION—No. 9.]

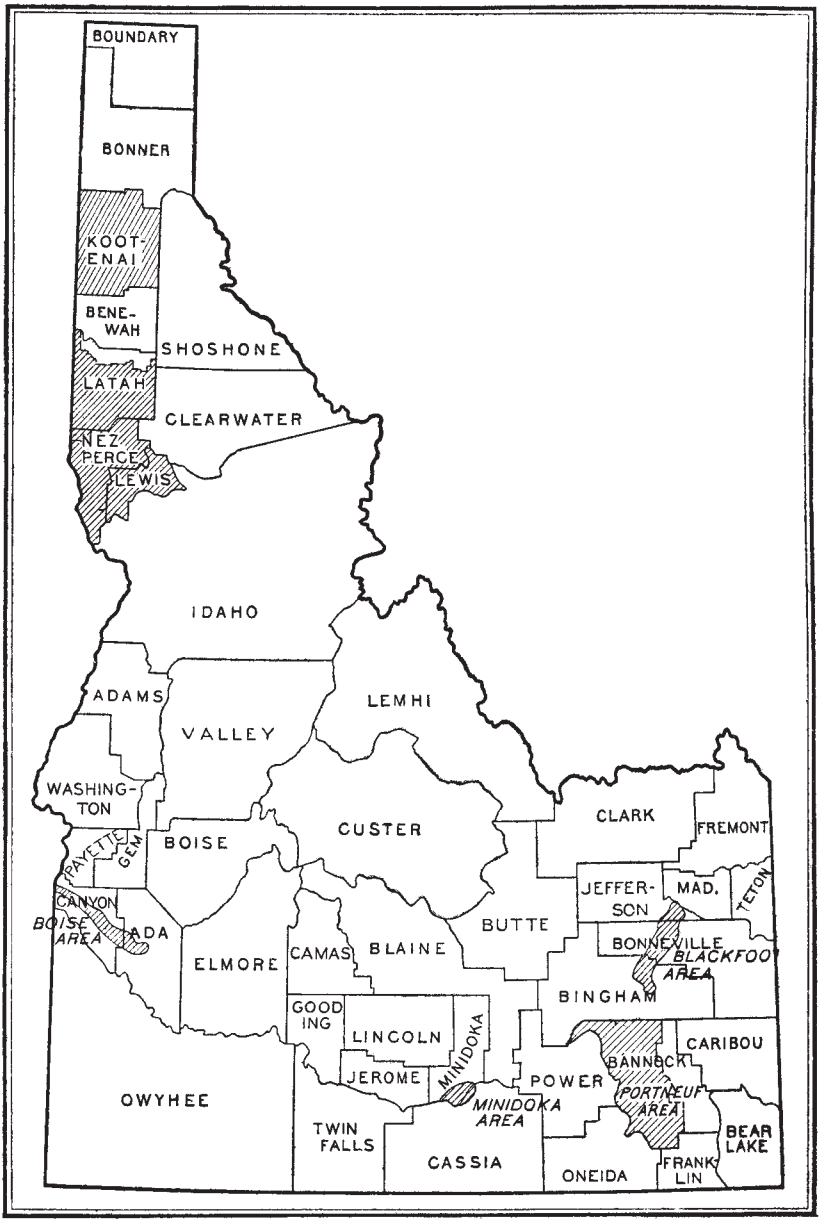
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved Ferbuary twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Idaho, shown by shading.

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BUREAU OF SOILS
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SOIL MAP
IDAHO
KOOTENAI COUNTY SHEET

UNIVERSITY OF IDAHO
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CONVENTIONAL SIGNS

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Secondary roads and Trails

Railroads Steam and Electric

Bridges, Ferry

R.R. crossings, Tunnel

Ford, Dam

School or Church, Cemeteries

Mine or Quarry, Mine dumps, Made land

Bluff, Escarpment, Rock outcrop and Triangulation station

Stony and Gravelly areas

Soil boundaries

Boundary lines

Boundary lines

Boundary lines

U.S. township and section lines

RELIEF
(Printed in brown or black)

Contours, Depression contours

Prominent Hills, Mountain Peaks

Sand, Wash, and Sand dunes

Shore and Low-water line, Sandbar

DRAINAGE
(Printed in blue)

Streams

Lakes, Ponds, Intermittent lakes

Intermittent streams

Springs, Canals and Ditches, Flumes

Swamp, Salt marshes

Submerged marsh, Tidal flats

The above signs are in current use on the soil maps. Variations from the usage appear in some maps of earlier date.

LEGEND

Cahlwell silty clay loam (Cc)	Loon very fine sandy loam (Lv)
Chamokane fine sandy loam (Cf)	Loon silt loam (Ls)
Chamokane silty clay loam (Cm)	Gravelly phase
Clayton silt loam (Ca)	Moscow loam (Ml)
Colville silty clay (Co)	Steep shallow phase (Ml)
Heavy phase (Co)	Narcisse fine sandy loam (Nf)
Garrison gravelly loam (Gl)	Palouse silt loam (Pa)
Heavy phase (Gl)	Terrace phase (Pa)
Stony phase (Gl)	Springdale gravelly loam (Sg)
Garrison coarse sandy loam (Gc)	Alluvial fan phase (Sg)
Helmer silt loam (Hr)	Stony phase (Sg)
Huckleberry silt loam (Hs)	Springdale gravelly silt loam (Ss)
Steep shallow phase (Hs)	Springdale coarse sandy loam (Sc)
Kootenai gravelly silt loam (Ka)	Gravelly phase (Sc)
Stony phase (Ka)	Springdale very fine sandy loam (Sv)
Rough broken land (Rl)	Underwood loam (Ul)
Rough mountainous land (Rm)	Muck and Peat (Mp)
Rough stony land (R)	Scabland (Sd)
Riverwash (Rv)	

DIAGRAM
Showing unsurveyed area

UNSURVEYED

Macy H. Lapham, Inspector, Western Division.
Soils surveyed by H. G. Lewis of the U. S. Department of Agriculture, in charge, and W. A. Denecke, Jr., of the University of Idaho.

BASE MAP IN PART FROM
U. S. GEOLOGICAL SURVEY SHEETS

1 ½ 0 1 2 3 4 Miles
Scale 1 inch=1 mile

A. HOEN & CO. BALTIMORE, MD.

Field Operations
Bureau of Soils
1919